RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT

2023 YEAR 1 RAFFLES PROGRAMME
MATHEMATICS

END OF YEAR REVISION BOOKLET

NAME : _____

CLASS: 1 ( )

INDEX NO. : _____

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS

END-OF-YEAR REVISION BOOKLET

Name: ( ) Class: 1 ( ) Date:

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INSTRUCTIONS FOR EXAMINATION

1. Answer all questions.
2. Write your answers in dark blue or black pen on the space provided. You may use a pencil for any diagrams or graphs.
3. Only approved scientific calculators may be used.
4. Omission of essential working will result in loss of marks.
5. Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
6. The number of marks is given in brackets [ ] at the end of each question or part question.
7. The total marks for Math is 80.

YEAR 1 RP MATHEMATICS
END-OF-YEAR EXAMINATION 2023

1. DATE & TIME OF PAPER

Duration: 2 Hours
Total: 80 marks

Important instructions:

- There will be bonus questions which are optional.
- You are to provide your own calculator and stationery.
- Only scientific calculators approved by Singapore Examinations and Assessment Board (SEAB) are allowed.
- You are required to write in either black or dark blue ink pens; pencils are allowed only for diagrams or graphs.
- No formula will be provided.
- Omission of essential working will result in loss of marks.

Topics to be tested:

No.	Topics
1	Real Number System I & II
2	Algebraic Expressions I (Basic Algebra)
3	Approximation and Estimation
4	Statistics I
5	Algebraic Expansion and Factorisation I
6	Algebraic Equations I
7	Linear Inequalities
8	Angle Properties
9	Arithmetic Problems
10	Pythagoras' Theorem
11	Mensuration I

Resources for revision:

1) Topical Worksheets
2) Class Tests
3) Assignments
4) Supplementary Exercises
5) Revision Worksheets (Compiled in a booklet)
6) Textbook – review questions at the end of each chapter

2022 and 2021 EOY Papers will be given to you in due course for your revision practice.

2. SYLLABUS OUTLINE

You should revise all the topics thoroughly.

1.	Real Number System	1. Number lines 2. Classification of numbers: rational, irrational, integers, whole numbers, natural numbers, fractions, decimals 3. Order of operations: BODMAS, remove brackets 4. Commutative, Associative & Distributive Laws 5. $\frac{1}{\frac{a}{b}} = \frac{b}{a}$ 6. Prime numbers 7. Tests of divisibility 8. Prime factorisation (in index notation) 9. Apply prime factorisation to find HCF, LCM, square root & cube root 10. $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ and $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ but $\sqrt{a \pm b} \neq \sqrt{a} \pm \sqrt{b}$ 11. Number patterns • Sum of natural numbers = $\frac{1}{2}n(n+1)$ • Triangular numbers (1, 3, 6, 10, 15, 21, 28, ...) $T_n = \frac{1}{2}n(n+1)$ • Fibonacci sequence (0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ...) • Pascal Triangle
2.	Algebraic Expressions I (Basic Algebra)	1. Write algebraic expressions 2. Evaluate algebraic expressions (substitute values) 3. Simplify algebraic expressions (remove brackets, collect like terms, add/subtract, multiply/divide) 4. Adding and subtracting polynomials 5. Express as a single fraction (use LCM as common denominator)
3.	Approximation & Estimation	1. Rounding off 2. Rules for writing significant figures (i) All non-zero figures are significant (ii) Zeros at the end of a decimal are significant (iii) Zeros that come before the first non-zero figure are not significant (iv) Zeros that lie between significant figures are significant (v) The final zeros in a whole number may or may not be significant depending on how the estimation is made 3. Estimate to one more s.f. or nearest square/cube root in working 4. Use = and ≈ appropriately

4.	Statistics I	1. Frequency table 2. Interpret statistical diagrams • Pie chart • Bar chart • Line graph • Dot diagram • Stem and leaf diagram 3. Explain misleading statistics 4. Measures of central tendency • Mean • Mode • Median
5.	Algebraic Expansion and Factorisation I	1. Expansion techniques (distributive law) 2. Algebraic Identities • $(a+b)^2 = a^2 + 2ab + b^2$ • $(a-b)^2 = a^2 - 2ab + b^2$ • $(a+b)(a-b) = a^2 - b^2$ 3. Factorisation by HCF, Identities and Grouping 4. Use identities to evaluate numerical expressions 5. Note: $a-b = -(b-a)$ $(a-b)^2 = (b-a)^2$
6.	Algebraic Equations I	1. Linear equations 2. Fractional equations 3. Word problems 4. Change subject of formula
7.	Linear Inequalities	1. Properties of inequalities: • if $x > y$, then $x+z > y+z$ and $x-z > y-z$ • if $x > y$ and $z > 0$, then $xz > yz$ and $\frac{x}{z} > \frac{y}{z}$ • if $x > y$ and $z < 0$, then $xz < yz$ and $\frac{x}{z} < \frac{y}{z}$ 2. Simultaneous linear inequalities: 3. Given two or more linear inequalities which are connected by the word 'and', the solution(s) to each inequality must satisfy all the others simultaneously. In other words, only the common solutions of the inequalities should be considered. Use a number line to see the common region.
8.	Angle Properties	1. Basic geometrical properties • adj. ∠s on a str. line • ∠s at a point • vert. opp. ∠s • corr. ∠s • alt. ∠s } state parallel lines • int. ∠s • ∠ sum of Δ • base ∠s of isos. Δ • ext. ∠ of Δ • ∠ sum of quad • opp. ∠s of //gram

		2. Angle properties of polygons • int. $\angle$ + ext. $\angle = 180°$ • Sum of int. $\angle$s of polygon = $(n-2)\times 180°$ • Sum of ext. $\angle$s of polygon = $360°$ **Please note that Geometrical Constructions will not be assessed in 2023 EOY.**
9.	Arithmetic Problems	1. Ratio • simplify ratios • equivalent ratios • $\frac{a}{b}=\frac{m}{n} \Rightarrow an = mb$ 2. Rate • Average speed • For rate of flow of water, take reciprocal of time (hour) to find the per hour contribution of each tap/pipe 3. Proportion • Direct proportion: $y = kx$, where k is a non-zero constant • Inverse proportion: $y = \frac{k}{x}$, where k is a non-zero constant 4. Scales and Maps • conversion of units • R.F. of map • linear scale • area scale 5. Percentage change $= \frac{\text{New value} - \text{Original value}}{\text{Original value}} \times 100\%$ 6. Profit, Loss, Discount, Commission (cost price, selling price, marked price, sale price) 7. Simple Interest: $I = \frac{PRT}{100}$ 8. Compound interest • $F = P\left(1+\frac{r}{100}\right)^n$ • Compund interest = $F - P$ 9. Hire Purchase 10. Currency exchange 11. GST (discount is always given first; GST is calculated after service charge) 12. Utilities bills

10.	Pythagoras' Theorem	1. $a^2+b^2=c^2$, where c is the hypotenuse 2. Solve problems involving right-angled Δs 3. Apply to problems involving area & perimeter
11.	Mensuration I	1. Area of trapezium = $\frac{1}{2}(a+b)h$ 2. Area of parallelogram = bh 3. Area of kite = $\frac{1}{2}\times$ product of diagonals 4. Arc length = $\frac{\theta}{360}\times 2\pi r$ 5. Area of sector = $\frac{\theta}{360}\times \pi r^2$ 6. Area of (minor) segment = minor sector – isos. Δ Area of (major) segment = major sector + isos. Δ

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 1: REAL NUMBER SYSTEM

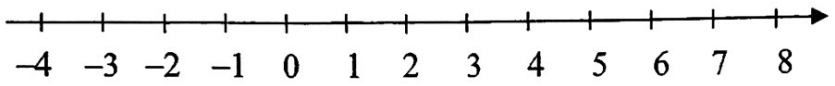
REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

Note: ***For Section A (marked with asterisk), use of calculators is not allowed.***

1 **2020/Y1RP/EOY/Q1**

(a) Complete the number line below to represent all **real numbers** greater or equal to –3 but less than 7. [1]



(b) Arrange the following in ascending order:

$\sqrt[3]{-\frac{64}{27}},\ -\pi,\ -3\%,\ -3\frac{1}{3}$. [1]

[Ans: (b) $-3\frac{1}{3},\ -\pi,\ \sqrt[3]{-\frac{64}{27}},\ -3\%$*]*

2 **2020/Y1RP/EOY/Q2**

A four-digit even number, **6X4Y**, is divisible by 9. By using test(s) of divisibility, find the smallest possible number. [2]

[Ans: 6048]

3 **2020/Y1RP/EOY/Q3(b)**

(b) **Without using a calculator**, evaluate $2\frac{2}{5}+\frac{3}{4}\div\sqrt{5\frac{1}{16}}-(-2)^2$, leaving your answer as a fraction. Show all steps clearly. [3]

[Ans: $-\frac{19}{15}$ or $-1\frac{4}{15}$*]*

4 **2020/Y1RP/EOY/Q5**

(a) The first three terms of a sequence are $-37,\ -33$ and -29.

(i) Find an expression, in terms of n, for the nth term of this sequence. [1]

(ii) Explain why 119 is a term in the sequence. [1]

(b) The first four terms in a sequence of numbers are given below.

$T_1 = 1^2 + 3$

$T_2 = 2^2 + 6$

$T_3 = 3^2 + 9$

$T_4 = 4^2 + 12$

(i) Write down an expression for T_5. [1]

(ii) Find an expression, in terms of n, for the nth term, T_n, of this sequence. [1]

(iii) Find the value of n such that $T_n = 270$. [1]

[Ans: (a)(i) $4n-41$ *(b)(i)* $T_5 = 5^2 + 15$ *(ii)* $T_n = n^2 + 3n$ *(iii) 15]*

5 **2020/Y1RP/EOY/Q4**

(a) Find the smallest positive integer that is divisible by 3, 5, 6 and 7. [1]

(b) **(i)** Given that $5544 = 2^3 \times 3^a \times 7 \times 11$, find the value of a. [1]

(ii) The highest common factor of two numbers is 2 and their lowest common multiple is 5544. Given that both numbers are greater than 70, find the two numbers. [2]

[Ans: (a) 210 (b)(i) a = 2 (ii) 154 and 72 OR 126 and 88]

6 **2019/Y1RP/EOY/Q1**

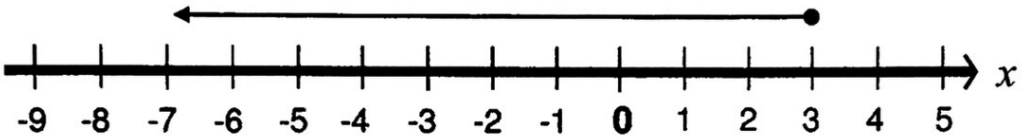
Arrange the following numbers in descending order. [1]

$$\sqrt{0.13}\ ,\ \frac{\pi}{8},\ -0.61^2,\ \frac{11}{30}$$

[Ans: $\frac{\pi}{8}, \frac{11}{30}, \sqrt{0.13}, -0.61^2$]

7 **2019/Y1RP/EOY/Q2**

A range of values of x is represented on the number line below.



Write down the inequality that represents this range of values of x. [1]

[Ans: $x \leq 3$]

8 **2019/Y1RP/EOY/Q3**

Without using a calculator, evaluate $\left(-\frac{3}{10}\right)^2 + \sqrt{6\frac{1}{4}} \div \left[2\times(-3) - 8(-2) - 8\times 2\right]$.

Show all steps clearly and leave your answer as a fraction in its simplest form. [3]

[Ans: $-\frac{49}{150}$]

9 **2019/Y1RP/EOY/Q7**

When written as a product of their prime factors,

$$a = 2^3 \times 3^9,$$
$$b = 2 \times 3^2 \times 7,$$
$$c = 2^2 \times 3 \times 11.$$

Find

(a) the value of the cube root of a, [1]

(b) the LCM of a, b, and c, giving your answer as a product of its prime factors, [1]

(c) the greatest number that will divide a, b, and c exactly. [1]

[Ans: (a) 54 (b) $2^3 \times 3^9 \times 7 \times 11$ (c) 6]

10 **2019/Y1RP/EOY/Q8**

Patient X, Patient Y and Patient Z repeat their blood test every 24 days, 48 days and $6n$ days respectively. All three patients have their blood test conducted on a particular day. 720 days later, all three patients have their blood test conducted again.

State the smallest possible **integer** value of n. [2]

[Ans: 15]

11 **2019/Y1RP/EOY/Q11**

Each term in the sequence below is formed by subtracting the same number from the previous term.

Position n	1	2	3	4	5	...	n
Term T_n	x	128	y	z	89	...	T_n

(i) Find the values of x, y and z. [2]

(ii) Write down an expression for T_n, the n th term of the sequence, in its simplest form. [1]

(iii) Is -223 a term in this sequence? Explain why. [2]

[Ans: (i) $x = 141$, $y = 115$, $z = 102$ (ii) $T_n = 154 - 13n$ (iii) Yes]

12 **2018/Y1RP/MYCT/SectA/Q1***

Use Arithmetic Law(s) to evaluate $2890 \times 3.7 + 289 \times 61 - (-28.9) \times 20$. [2]

[Ans: 28900]

13 **2018/Y1RP/MYCT/SectA/Q5***

(a) Find the largest possible value of W such that $5W402$ is divisible by 6. [1]

(b) Given that $n = 8k + 3$, where n and k are whole numbers.
Find the remainder when $6n$ is divided by 8. [2]

[Ans: (a) 7 (b) 2]

14 **2018/Y1RP/MYCT/SectA/Q6***

Evaluate $\sqrt[3]{3\frac{3}{8} \times (-6) - (-5)^2} + \sqrt{-\frac{9}{14} \div \frac{11}{28} \times \left(-5\frac{1}{2}\right)}$. [4]

[Ans: -31]

15 **2018/Y1RP/MYCT/SectA/Q9***

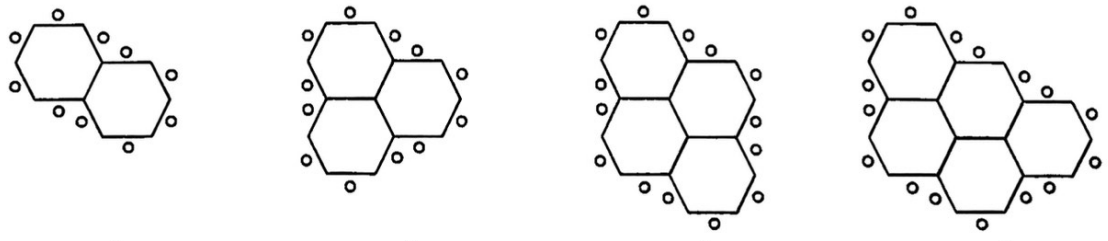
(a) Express 540 as a product of its prime factors in index notation. [1]
Hence, state the smallest integer value of p such that
(i) $540p$ is a perfect square, [1]
(ii) $540p$ is a multiple of 75. [1]

(b) When a positive rational number is divided by each of the fractions $\frac{3}{4}$, $\frac{5}{6}$ and $\frac{9}{10}$, the result is always a whole number. Find the smallest possible value of the rational number. [2]

[Ans: (a) $540 = 2^2 \times 3^3 \times 5$ (i) 15 (ii) 5 (b) $\frac{45}{2}$]

16 **2018/Y1RP/MYCT/SectB/Q5**

The diagram shows a sequence of figures formed by hexagons and small circles.



$n = 1$ $n = 2$ $n = 3$ $n = 4$

Let the number of hexagons and circles in the n^{th} pattern be H_n and C_n respectively.

(a) Complete the following table. [1]

n	1	2	3	4
H_n	2	3	4	
C_n	10	12		16

(b) Find an expression, in terms of n, for

(i) H_n, [1]

(ii) C_n. [1]

(c) Find the number of hexagons if there are 50 circles. [2]

[Ans: (b)(i) $H_n = n+1$ (ii) $C_n = 2n+8$ (c) 22]

17 **2018/Y1RP/EOY/SectA/Q1***

Arrange the numbers in descending order $-\sqrt[3]{\frac{512}{27}}$, -0.667, $\frac{28}{3}$, π. [2]

[Ans: $\frac{28}{3}$, π, -0.667, $-\sqrt[3]{\frac{512}{27}}$]

18 **2018/Y1RP/EOY/SectA/Q2***

The numbers 252 and 400, written as the products of their prime factors, are

$$252 = 2^2 \times 3^2 \times 7$$

$$400 = 2^4 \times 5^2$$

Find

(a) the highest common factor of 252 and 400, [1]

(b) the smallest positive integer value of m such that $252m$ is a multiple of 56, [1]

(c) the smallest positive integer value of n such that $\sqrt[3]{400n}$ is a whole number. [1]

[Ans: (a) 4 (b) 2 (c) 20]

19 **2017/Y1RP/MYCT/SectA/Q1***

Draw a number line to represent all natural numbers less than 16 which are multiples of 4. [2]

20 **2017/Y1RP/MYCT/SectA/Q2***

Evaluate $\frac{3}{11} \div (29-32)^2 \times [-71-(-23)+162 \div (-9)]$. [3]

[Ans: –2]

21 **2017/Y1RP/MYCT/SectA/Q4***

The lowest common multiple of 6, 21 and x is 126. Find the two possible values of x which are odd numbers. [3]

[Ans: 63]

22 **2017/Y1RP/MYCT/SectA/Q11***

The sum of the four-digit number 1**X**28 and the three-digit number 43**Y** is a number that is divisible by 4, 5 and 9. By using tests of divisibility, determine the value of **X** and of **Y**. [4]

[Ans: X = 7, Y = 2]

23 **2017/Y1RP/MYCT/SectB/Q6**

The first 4 terms in a sequence of positive integers are given below.

$$a_1 = 1^2 + 2^2 + 2^2 = 3^2$$
$$a_2 = 2^2 + 3^2 + 6^2 = 7^2$$
$$a_3 = 3^2 + 4^2 + 12^2 = 13^2$$
$$a_4 = 4^2 + 5^2 + p^2 = q^2$$

(a) Find the values of p and q. [2]

(b) It is given that $a_x = x^2 + (x+1)^2 + y^2$. Express y in terms of x. [1]

Hence,

(i) find the value of x if $a_x = 5403^2$. [1]

(ii) show that $a_x = x^4 + 2x^3 + 3x^2 + 2x + 1$. [3]

[Ans: (a) p = 20, q = 21 (b)(i) x = 73]

24 **2017/Y1RP/EOY/SectA/Q1***

(a) Express 324 as a product of its prime factors. [1]

(b) Given that m and n are both prime numbers, find the values of m and n such that $324 \times \frac{m}{n}$ is a perfect cube. [1]

[Ans: (a) $324 = 2^2 \times 3^4$ (b) m = 2, n = 3]

25 **2017/Y1RP/EOY/SectA/Q2***

A class notice board is x cm long and 28 cm wide. Hadi wants to cover the board fully with identical square papers without overlapping and the largest possible square paper he could use is 14 cm by 14 cm. Given further that the LCM of x and 28 is $252 = 2^2 \times 3^2 \times 7$, find

(a) the value of x, leaving your answer in index notation, [2]

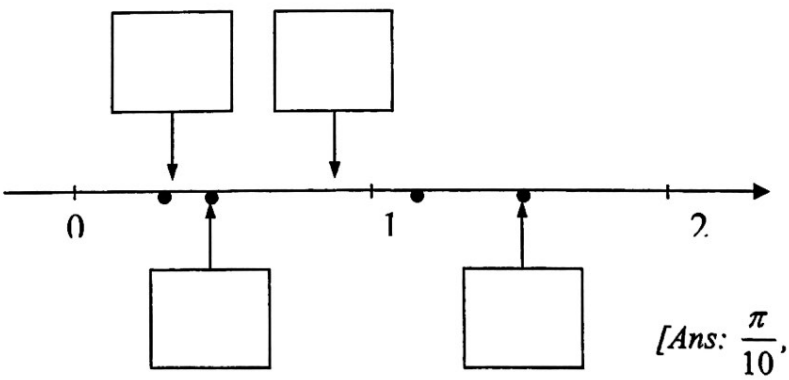
(b) the number of 14 cm by 14 cm square papers used. [2]

[Ans: (a) $x = 2 \times 3^2 \times 7$ (b) 18]

26 **2016/Y1RP/MYCT/SectA/Q1 ***

Place the following numbers in the correct boxes which indicate their positions on the number line given below. [2]

$$\sqrt[3]{3\frac{3}{8}}, \quad 0.\dot{4}\dot{5}, \quad \frac{\pi}{10}, \quad 1\frac{1}{6}$$



[Ans: $\frac{\pi}{10}$, $0.\dot{4}\dot{5}$, $1\frac{1}{6}$, $\sqrt[3]{3\frac{3}{8}}$]

27 **2016/Y1RP/MYCT/SectA/Q2***

Evaluate $\left(2\frac{2}{3}-4\right)-\left(-\frac{1}{4}\right)^2\times\sqrt{-1+\frac{25}{9}}$. [3]

[Ans: $-1\frac{5}{12}$]

28 **2016/Y1RP/MYCT/SectA/Q5***

(a) For each of the following five-digit numbers, fill in the **smallest possible digit** in the blank provided to make the five-digit number divisible by the number in the bracket.

(i) 67 35__ (4) [1]

(ii) 8__ 420 (12) [1]

(b) If n is an integer, find the remainder when $(3n+4)^2$ is divided by 3. [2]

[Ans: (a)(i) 67 352 (ii) 81 420 (b) 1]

29 **2016/Y1RP/MYCT/SectA/Q7***

(a) (i) Express 3960 as a product of prime factors in **index notation.** [1]

(ii) Given that $A=2^2\times3^4\times5^2$, write down the Least Common Multiple (LCM) and the Highest Common Factor (HCF) of 3960 and A. Leave your answer in **index notation.** [2]

(b) Given that $4725 = 3^3\times5^2\times7$.

(i) Find the smallest integer value of p for which $\sqrt{4725\times p}$ is a nonzero integer. [1]

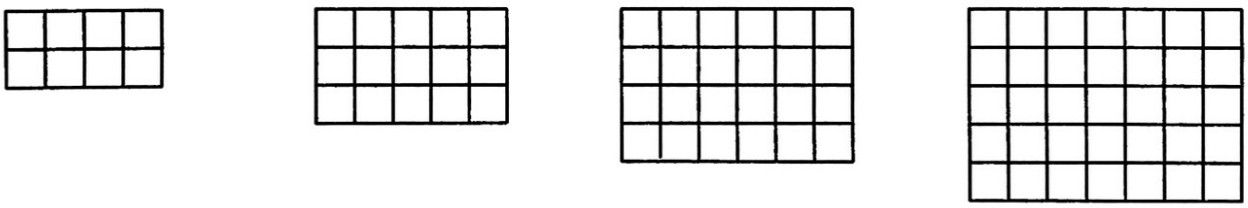
(ii) Find the smallest nonzero value of q for which $4725\times q$ is divisible by 66. [1]

[Ans: (a)(i) $2^3\times3^2\times5\times11$ (ii) LCM = $2^3\times3^4\times5^2\times11$, HCF = $2^2\times3^2\times5$ (b)(i) 21 (ii) 22]

30 **2016/Y1RP/MYCT/SectB/Q6**

The first four figures of a sequence are as shown.

Figure 1 Figure 2 Figure 3 Figure 4



The number of small squares in each figure, S_n, and the total number of squares in each figure, T_n, are given in the table below, where n is the figure number.

Figure No. (n)	Number of Small Squares (S_n)	Total Number of Squares (T_n)
1	8	11
2	15	26
3	24	50
4	35	85
⋮	⋮	⋮
n	S_n	$T_n=\frac{1}{6}(2n^3+15n^2+31n+18)$

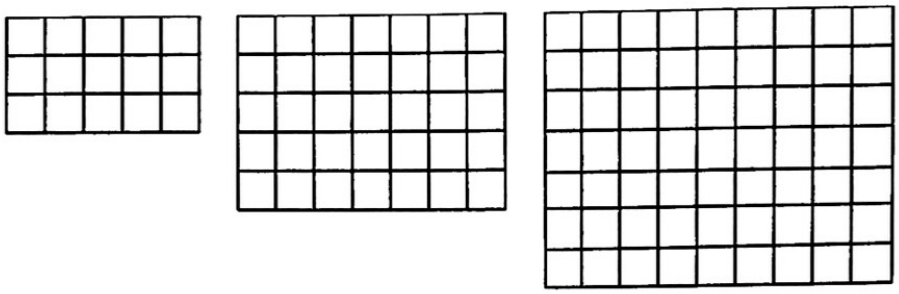
(a) Find the value of S_5 and T_5. [2]

(b) Express S_n in terms of n. [1]

(c) Given that m is an even number, justify whether S_m can be 61502. Show your explanation clearly. [1]

A second sequence of a similar pattern is shown below.

Figure 1 Figure 2 Figure 3



The total number of squares in each figure, V_n, are given in the table below.

Figure No. (n)	Total Number of Squares (V_n)
1	26
2	85
3	196
⋮	⋮
n	V_n

(d) Using the formula for T_n, express V_n in terms of n. [2]

[Ans: (a) 48, 133 (b) $S_n = (n+1)(n+2)+(n+1)$ (c) No (d) $V_n = \frac{1}{3}\left(8n^3+30n^2+31n+9\right)$]

31 2016/Y1RP/EOY/SectA/Q1*

Arrange the following in ascending order. $-\frac{3}{8}$, $-0.\dot{3}$, 230%, $-\frac{3}{7}$. [1]

[Ans: $-\frac{3}{7}$, $-\frac{3}{8}$, $-0.\dot{3}$, 230%,]

32 2016/Y1RP/EOY/SectA/Q2*

Evaluate $-3^2 \times \sqrt{1\frac{7}{9} - \frac{4}{5} \div 2\frac{2}{5}}$. [2]

[Ans: $-12\frac{1}{3}$]

33 2016/Y1RP/EOY/SectA/Q6*

Arjun and Bing Yi walk on a circular track with radius 60 m at a constant speed of 0.3π m/s and 0.5π m/s respectively.

(a) Write down the time taken, in seconds, for Arjun to walk one round of the track. [1]

(b) Write down the time taken, in seconds, for Bing Yi to walk one round of the track. [1]

At 0800 h, both boys start walking from a point P in the opposite direction on the same circular track.

(c) When will they next meet again at P? [3]

[Ans: (a) 400 s (b) 240 s (c) 0820 h]

34 2015/Y1RP/MYCT/SectA/Q1*

Draw a number line to represent all odd and composite natural numbers that are between 8 and 18. [2]

35 **2015/Y1RP/MYCT/SectA/Q2***

Evaluate $\left[\left(-3\frac{1}{4}\right)\div\left(5\frac{1}{5}\right)+2\right]\times\left(-1+\frac{1}{3}\right)$. [2]

[Ans: $-\frac{11}{12}$]

36 **2015/Y1RP/MYCT/SectA/Q3***

Given that $\sqrt[3]{85.64}=4.408$ and $\sqrt[3]{856.4}=9.496$, find the value of $\sqrt[3]{0.8564}$. [2]

[Ans: 0.9496]

37 **2015/Y1RP/MYCT/SectA/Q8***

Given that the lowest common multiple of 21, 42 and x is 252, find the smallest value of x. [2]

[Ans: 36]

38 **2015/Y1RP/EOY/SectA/Q1***

Write down the irrational numbers in $-\sqrt{4}, \pi^2, \frac{22}{7}, 0.1\dot{3}, \sqrt{11}, \frac{7}{5}$. [1]

[Ans: $\pi^2, \sqrt{11}$]

39 **2015/Y1RP/EOY/SectA/Q3***

The lowest common multiple of $\frac{270}{k}$ and 84 is 252 where k is a positive constant. By using prime factorization, find the smallest value of k. [2]

[Ans: 15]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 2: ALGEBRAIC EXPRESSIONS I

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

Note: ***For Section A (marked with asterisk), use of calculators is not allowed.***

1 **2020/Y1RP/EOY/Q3(a)**

(a) Given that $x=4$, $y=1\frac{3}{5}$ and $z=-122$, evaluate $\dfrac{\sqrt{2x^4-\sqrt[3]{z}}}{\frac{3}{2}-3y}$, giving your answer correct to 4 significant figures. [1]

[Ans: −6.890]

2 **2020/Y1RP/EOY/Q6**

(a) Simplify $\sqrt{\dfrac{x^4y^6}{36}}\div\dfrac{x^2(2xy)}{3z^2}$. [2]

(b) Subtract $7p^2-3p^3+5pq$ from $8p^3+p^2-3p+pq-8$ and simplify your expression. [2]

[Ans: (a) $\dfrac{y^2z^2}{4x}$ *(b)* $11p^3-6p^2-3p-4pq-$*]*

3 **2020/Y1RP/EOY/Q9**

Simplify $\dfrac{7}{2x-2}+\dfrac{5x+4}{1-x}-2$ as a fraction in its simplest form. [3]

[Ans: $\dfrac{3-14x}{2(x-1)}$*]*

4 **2019/Y1RP/EOY/Q6**

Given that $a=-3$, $b=4$ and $c=-2$, evaluate $\dfrac{2c^2+ab}{b-ac^3}$, showing your workings clearly. [2]

[Ans: $\frac{1}{5}$*]*

5 **2019/Y1RP/EOY/Q12**

Simplify $\dfrac{(3xy)^2}{8z}\div\dfrac{9xyz}{\sqrt{16z^2}}$. [3]

[Ans: $\frac{xy}{2z}$*]*

6 **2018/Y1RP/MYCT/SectA/Q2***

Given that $\dfrac{3a-b}{2a-3b}=\dfrac{3}{5}$, find the value of $\dfrac{a}{b}$. [2]

[Ans: $-\frac{4}{9}$*]*

7 **2018/Y1RP/MYCT/SectA/Q4***

Given that $\frac{(2x^2)^3}{\sqrt[3]{64x^{6m}}} = k$, where m and k are constants, find the value of m and of k.[3]

[Ans: $m = 3$, $k = 2$]

8 **2018/Y1RP/MYCT/SectB/Q1**

Express as a single fraction $5\left(\frac{3x+2}{6}+\frac{x}{3}\right)-\frac{1}{2}\left(4-\frac{3}{x}\right)$. [3]

[Ans: $\frac{25x^2-2x+9}{6x}$]

9 **2018/Y1RP/MYCT/SectB/Q4**

The perimeter of a rectangle is $(18ax-4by+6bx-12ay)$ cm and its width is $(3bx-6ay)$ cm.

(a) Express and simplify the length of the rectangle in terms of a, b, x and y. [2]

(b) Hence find the length of the rectangle if $a=3$, $b=-1$, $x=5$ and $y=-2$. [2]

[Ans: (a) $(9ax-2by)$ cm (b) 131 cm]

10 **2018/Y1RP/EOY/SectB/Q1**

(a) Simplify $\frac{(-4p^2)^3}{pq}\times\frac{q^3}{16p^2}$. [2]

(b) Simplify $\left(\frac{1}{x}-\frac{1}{y}\right)\div\left(\frac{1}{x^2}-\frac{1}{y^2}\right)$. [2]

[Ans: (a) $-4p^3q^2$ (b) $\frac{xy}{y+x}$]

11 **2017/Y1RP/MYCT/SectA/Q3***

Simplify the expression $\frac{1}{\sqrt[3]{\frac{216}{x^3}}}$. [2]

[Ans: $\frac{1}{6}x$ or $\frac{x}{6}$]

12 **2017/Y1RP/MYCT/SectA/Q5***

It is given that $\frac{2a-b}{4a-3b}=\frac{3}{4}$. Find the value of $\frac{2a}{5b}$. [2]

[Ans: $\frac{1}{2}$]

13 **2017/Y1RP/MYCT/SectA/Q6***

Simplify the expression $\frac{(3x)^2}{10y}\div\frac{6x}{5y^4}$. [2]

[Ans: $\frac{3}{4}xy^3$]

14 **2017/Y1RP/MYCT/SectB/Q1**

Given that x apples cost y dollars and z cents.

(a) Find the cost of 1 apple, in cents. [1]

(b) Write down an expression for the number of apples that could be bought for p dollars. [1]

[Ans: (a) $\frac{100y+z}{x}$ cents (b) $\frac{100px}{100y+z}$]

15 **2017/Y1RP/MYCT/SectB/Q2**

Express $\frac{2x-3}{5}+\frac{3(1-3x)}{4}-\frac{1}{2}$ as a single fraction. [3]

[Ans: $-\frac{37x+7}{20}$]

16 **2017/Y1RP/EOY/SectB/Q1(a)**

(a) Simplify the expression $\frac{8x-3y}{15}-\frac{2(x+5)}{5}+1\frac{3}{5}$. [2]

[Ans: (a) $\frac{2x-3y-6}{15}$]

17 **2016/Y1RP/MYCT/SectA/Q4***

Simplify the following expressions.

(a) $18a^2-\{3a^2-[-3a(4a-5b)+2]+4ab\}-7$, [2]

(b) $\sqrt{\frac{64a^4}{49b^2}}\div\left(-\frac{2a}{b^2}\right)^3\times\frac{c}{2b^3}$. [2]

[Ans: (a) $3a^2+11ab-5$ (b) $-\frac{b^2c}{14a}$]

18 **2016/Y1RP/MYCT/SectB/Q2**

A cuboid container has a volume of $(6x^3+2x^2y-4x^2z-2xyz)$ m^3 and is **half-filled** with water. A volume of $(x^3+4x^2y-2xyz)$ m^3 of water is poured into the container and $(4x^3-2x^2z)$ m^3 of water is then removed from the container. Find the volume of water left in the container in m^3. [3]

[Ans: $5x^2y-3xyz$ or $xy(5x-3z)$]

19 **2016/Y1RP/EOY/SectB/Q4**

Simplify the following.

(a) $2(3m^2-4m)-3m[-2-3(1-m)]$, [2]

(b) $\frac{4-5h}{3}-\frac{h-2}{4}$. [2]

[Ans: (a) $7m-3m^2$ or $m(7-3m)$ (b) $\frac{22-23h}{12}$]

20 **2015/Y1RP/MYCT/SectA/Q5***

Given that $a=1$, $b=0$, $c=-2$ and $d=3$, evaluate the expression $a(b-c)-b(c-d)+c(d-a)$. [2]

[Ans: −2]

21 **2015/Y1RP/MYCT/SectA/Q7***

Expand and simplify the expression $\frac{1}{2}\left[14x-\frac{2}{3}(9x-21y)\right]$. [2]

[Ans: 4x + 7y]

22 **2015/Y1RP/MYCT/SectB/Q4**

Simplify the following expressions.

(a) $\sqrt{\frac{4x^2}{9y^4}} \div \frac{8}{3xy}$ [3]

(b) $\frac{7(p-1)}{12p} - \frac{2}{3p}$ [2]

[Ans: (a) $\frac{x^2}{4y}$ (b) $\frac{7p-15}{12p}$]

23 **2015/Y1RP/MYCT/SectB/Q5**

Expand and simplify the expression $(4x+1)(x^2-2)-x(2x-8)$. [3]

[Ans: $4x^3-x^2-2$]

24 **2015/Y1RP/EOY/SectA/Q6***

Simplify the expression $\frac{c^2}{3a^2b} \div \sqrt{\frac{b^6}{4a^4}}$. [2]

[Ans: $\frac{2c^2}{3b^4}$]

25 **2015/Y1RP/EOY/SectA/Q7***

Given that $x=2$, $y=-1$, $a=2$ and $b=3$, evaluate $y^b+2x^ay-y^a$. [2]

[Ans: −10]

26 **2015/Y1RP/EOY/SectB/Q2**

Expand and simplify $(3a+2b)(3a-2b)-(a+b)(a-4b)$. [3]

[Ans: $8a^2+3ab$]

27 **2014/Y1RP/MYCT/SectA/Q7***

Expand and simplify the following algebraic expressions.

(a) $5(x+y)(y-x)-2y^2(x-1)$, [3]

(b) $\frac{(-10x^2y)^2}{6x} \div \frac{25x^2y^2}{-2(3x)}$ [3]

[Ans: (a) $7y^2-5x^2-2xy^2$ (b) $-4x^2$]

28 **2014/Y1RP/EOY/SectB/Q6**

Given that $A=\frac{3x}{3x-1}$ and $B=\frac{15x^2}{2(1-3x)}$, show that $\frac{5}{3}A+2B=-5x$. [3]

29 **2013/Y1RP/MYCT/SectB/Q1**

Subtract $3a^3+a^2b-4b^2-1$ from $2a^3+5b^2+6$ and simplify your expression. [2]

[Ans: $-a^3-a^2b+9b^2+7$]

30 **2013/Y1RP/MYCT/SectB/Q2**

Given that $a=2$, $b=-4$ and $c=16$, evaluate a^3-b^a+c. [2]

[Ans: 8]

31 **2013/Y1RP/MYCT/SectB/Q5**

Simplify the following expressions.

(a) $\sqrt{\frac{a^6b^4}{49}} \div \frac{6}{7}a^2b$, [2]

(b) $\frac{7}{2x-3} - \frac{x-1}{3-2x}$. [2]

[Ans: (a) $\frac{ab}{6}$ (b) $\frac{x+6}{2x-3}$]

32 **2013/Y1RP/EOY/SectA/Q5***

Given that $a = 2$, $b = 3$ and $c = -1$, find the value of

(a) $\frac{1}{c} + \frac{b}{a} - \frac{1}{b}$, [1]

(b) $(ac)^3 + 3b^2 - 5abc$. [2]

[Ans: (a) $\mathbf{\frac{1}{6}}$ (b) 49

33 **2012/Y1RP/MYCT/SectB/Q2**

(a) Find the algebraic expression that must be added to the expression $-x^2 + 2xy + 3y^2 - 5$ to obtain the expression $x + 2xy + 2y^2$. [2]

(b) If $2a + b = 10$ and $c = -2$, find the value of $a + \frac{b}{2} - 3c^2$. [2]

[Ans: (a) $x^2 - y^2 + x + 5$ (b) -7]

34 **2012/Y1RP/MYCT/SectB/Q3**

Simplify

(a) $\frac{(3x^3y)^2}{6x^2y} \div \frac{y}{(2x)(2x^3)}$, [2]

(b) $\frac{x}{x+1} - \frac{2x-1}{3(x+1)}$. [2]

[Ans: (a) $6x^8$ (b) $\frac{1}{3}$]

35 **2012/Y1RP/EOY/SectA/Q5**

Simplify $\frac{(3ab)^2}{12ab^4} \div \sqrt{\frac{b^{16}}{16}}$. [2]

[Ans: $\frac{3a}{b^{10}}$]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 3: APPROXIMATION AND ESTIMATION

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

*Note: **For Section A and Paper 1 (marked with asterisk), use of calculators is not allowed.***

1 **2020/Y1RP/EOY/Q14**

The table below shows the performances of a soccer team over a series of matches.

Number of goals scored	0	1	2	3	4	5
Number of matches	4	3	x	5	3	2

(a) If the mode is 3 goals scored, find the greatest possible value of x. [1]

(b) If the median is 3 goals scored, find the greatest possible value of x. [1]

(c) If the mean is 2.3 goals scored, find the value of x. [3]

[Ans: (a) 4 (b) 2 (c) 3]

2 **2019/Y1RP/EOY/Q4**

The length and breadth of a rectangular school field are 97.82 m by 48.31 m respectively.

(a) Round off the length of the school field to 2 significant figures in km. [1]

(b) Find the area of the school field in m^2, correct to the nearest $0.1\ m^2$. [2]

[Ans: (a) 0.098 km (b) 4725.7 m^2]

3 **2018/Y1RP/MYCT/SectA/Q7***

A number with 499 899 corrected to n significant figures is 500 000. Write down the possible values of n. [1]

[Ans: n = 1, 2 or 3]

4 **2017/Y1RP/MYCT/SectA/Q9***

(a) An integer, x, when correct to 3 or 4 significant figures, is 329 000. Write down the smallest possible value of x. [1]

(b) Estimate the value of $\dfrac{56.048\times 2.997-16.02}{\sqrt[3]{514}}$, giving your answer correct to 1 significant figures. [3]

[Ans: (a) 328950 (b) 20]

5 **2014/Y1RP/EOY/SectA/Q3***

(a) Express the following numbers to two significant figures,

(i) 488.63, (ii) 0.50418. [2]

(b) Hence, estimate the value of $488.63\div 0.50418$ to one significant figure. [1]

[Ans: (a)(i) 490 (ii) 0.50 (b) 1000]

6 **2012/Y1RP/MYCT/SectA/Q8***

The sum of two recurring decimals, A and $93.\dot{4}\dot{7}$, is 124 when estimated to 3 significant figures. Deduce the **smallest** possible value of A. [2]

[Ans: $30.0\dot{2}\dot{5}$]

7 **2006/Y1RP/CT1/SectA/Q3***

(a) Write down the value of $\frac{25.01}{5.0031}$ to two significant figures. Use your result to estimate the value of $\frac{2501}{0.50031}$ to 1 significant figure. [2]

(b) The number 999 999 corrected to n significant figures is 1 000 000. Write down all possible values of n. [2]

[Ans: (a) 5.0 (b) n = 1, 2, 3, 4, 5]

8 **2004/Y1RP/CT1/SectA/Q5***

A flat circular disk has a radius of 11 cm measured to the nearest cm. Find the least possible area of the disk. (Take $\pi = \frac{22}{7}$) [2]

[Ans: 346.5 cm^2]

9 **2004/Y1RP/CT1/SectA/Q6***

The number 3 200 276 corrected to n significant figures is 3 200 000. Write down the possible value(s) of n. [2]

[Ans: 2, 3 or 4]

10 **2002/S1MA/EOY/P1/Q7***

For a real number p, the expression $\frac{3p+1}{4}$, estimated to 1 decimal place, is equal to -0.7. Find the largest possible value of p. [3]

[Ans: $p = -1.2$]

11 **2001/S1MA/EOY/SectA/Q8***

(a) A number, when correct to 5 significant figures, becomes 2 200 000. Write down the smallest possible value of this number. [1]

(b) Sharon went to a furniture shop and bought a candle, in the shape of a cube, for \$5.41.

(i) If the cost of 1 kg of the wax is \$1.99, estimate the mass of the candle, giving your answer correct to the nearest 0.1 kg. [1]

(ii) If the density of the wax is 99.83 kg/m^3, estimate the length of each side of the cube, leaving your answer in metres, correct to 1 significant figure. [3]

[Ans: (a) 2 199 950 (b)(i) 2.7 kg (ii) 0.3 m]

12 **2001/S4EM/P1/Q6(a)***

The number 899899 when corrected to m significant figures is 900000. State the largest possible value of m. [1]

[Ans: m = 3]

13 **1998/S4EM/P1/Q5***

Jack's weight is 58.6 kg and Simon's weight is 68.2 kg, measured correct to 3 significant figures. Find

(i) the greatest possible value of Jack's weight, [1]

(ii) the least possible difference in their weights in kg. [1]

[Ans: (a) 58.64 kg (b) 9.5 kg]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 4: STATISTICS I

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

Note: ***For Section A (marked with asterisk), use of calculators is not allowed.***

1 **2019/Y1RP/EOY/Q9**

The stem and leaf diagram below shows the scores of 32 students in a Mathematics class test. The full mark of the test is 35 marks.

Stem	Leaf
0	5 5 7 9
1	2 3 4 5 6 7 8 9 9
2	1 1 2 3 3 3 4 5 5 p 7 8 9
3	0 0 1 2 3 5

Key : 2 | 1 means 21 marks

(a) Given that the only modal score is 23, state the possible value(s) of p. [1]

(b) Calculate the percentage of students that scored at least 80 % of the full mark. [1]

[Ans: (a) p = 6 or 7 (b) 25%]

2 **2019/Y1RP/EOY/Q10**

Some Year 1 students were asked the number of hours each of them spent using his mobile phone on a particular day. The results are shown in the table.

Number of hours	0	1	2	3	4
Number of students	5	11	14	x	3

Find

(a) the mean number of hours spent per person in terms of x, [2]

(b) the smallest possible value of x if the mode is 3, [1]

(c) the largest possible value of x if the median is 2. [1]

[Ans: (a) $\frac{51+3x}{33+x}$ *(b) 15 (c) 26]*

3 **2016/Y1RP/EOY/SectB/Q12**

The following stem and leaf diagram shows the marks of 16 students each in Class 2A and 2B in a Mathematics test.

Leaf (Class 2A)	Stem	Leaf (Class 2B)
0	1	6 8 9
2 1 0	2	0 2 3 4
9 8 6 3 3 y 1	3	1 x 8
9 7 3 1 0	4	5 6 8 8 9
	5	6

(a) Given that the median mark of Class 2B is 32, find the value of x. [1]

(b) **(i)** The modal mark of Class 2A is 33. List the possible values of y. [1]

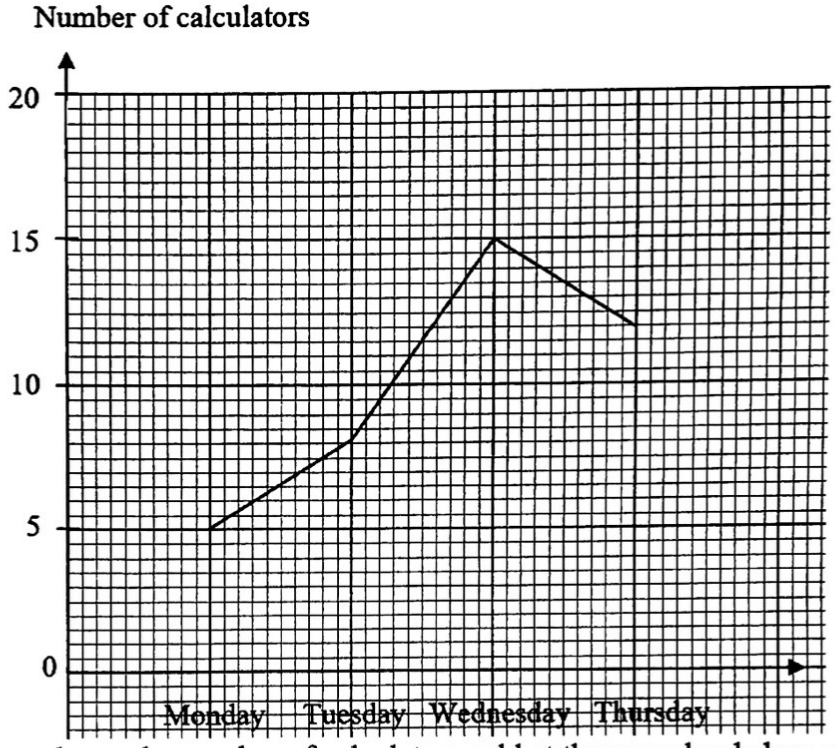
(ii) Given further that the mean mark of Class 2A is 33.5, hence find the value of y. [2]

(c) The mean mark of Class 2B is also 33.5. Explain, with reason, if both classes perform equally well. [1]

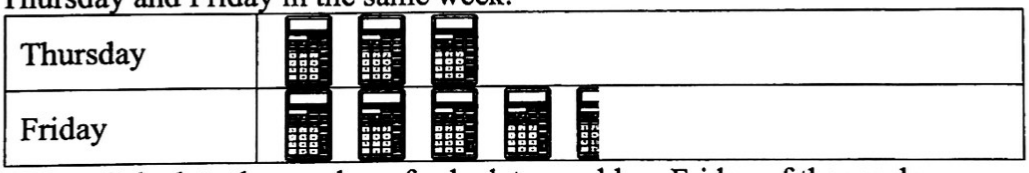
[Ans: (a) $x = 3$ (b)(i) $y = 2$ or 3 (ii) $y = 3$ (c) Class 2A performs better]

4 **2018/Y1RP/EOY/SectA/Q5***

The line graph shows the number of calculators sold at a bookshop from Monday to Thursday in a certain week.



The pictogram shows the number of calculators sold at the same bookshop on Thursday and Friday in the same week.



(a) Calculate the number of calculators sold on Friday of the week. [1]

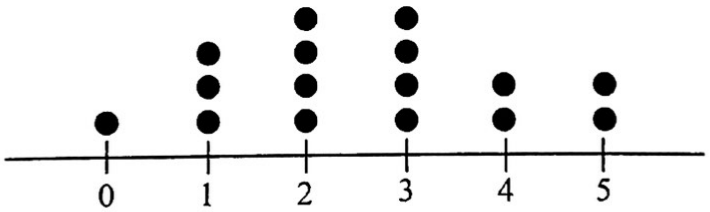
(b) The total number of calculators sold on Saturday and Sunday is $\frac{2}{3}$ of all the calculators sold for the entire week. Find the total number of calculators sold on Saturday and Sunday. [2]

(c) Ariff said it is more suitable to represent the number of calculators sold using a pictogram as compared to a line graph. Do you agree with him? Why? [1]

[Ans: (a) 18 (b) 116 (c) No]

5 **2017/Y1RP/EOY/SectB/Q7**

(a) The dot diagram below shows the results of a survey conducted among 16 staff on the number of mobile devices they each owned.



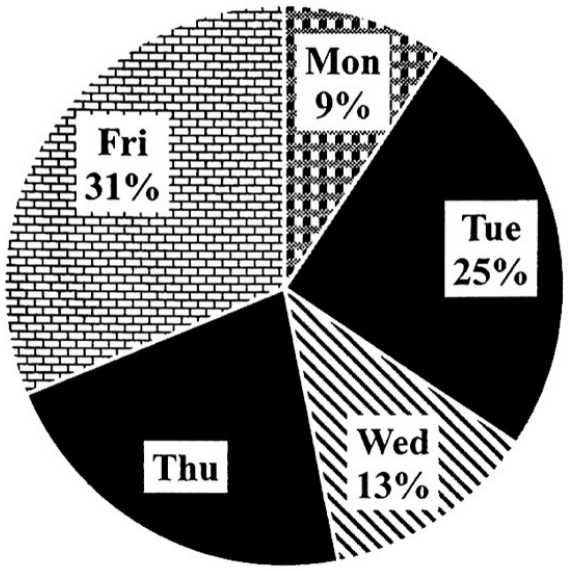
(i) State the modal number(s) of mobile devices owned by the staff. [1]

(ii) Find the median number of mobile devices owned by the staff. [1]

(iii) Another four staff were surveyed. They each owned 2 mobile devices. Find the new mean number of mobile devices owned by the staff. [2]

(b) Ethan surveyed his batchmates in year 1 on the average number of hours spent doing homework from Monday to Friday in a week. He represented the data using the following pie chart.

Average No. of Hours Year 1 Students Spent Doing Homework from Monday to Friday in a week



One of Ethan's classmates, David, said that the survey results represented by the pie chart showed that the average number of hours year 1 students spent doing homework is the same for Tuesday and Thursday. Do you agree with David? Support your answer with reasoning. [1]

[Ans: (a)(i) 2 and 3 (ii) 2.5 (iii) 2.45 (b) Disagree]

6 **2015/Y1RP/MYCT/SectB/Q1**

In a particular test, each student scores 10, 15 or 20 marks. The table below shows the number of students scoring each mark.

Mark	10	15	20
Number of students	x	20	10

(a) If the mode is 10, write down the least possible value of x. [1]

(b) If the median mark is 15, find the largest possible value of x. [1]

a. If the total mark for all students is 640, find the value of x. [2]

[Ans: (a) 21 (b) 29 (c) 14]

7 **2015/Y1RP/MYCT/SectB/Q2**

The following stem and leaf diagram shows the amount of time, in minutes, spent by Ben and Darren in completing their homework each day for a period of 20 days.

leaves for Ben	Stem	leaves for Darren
8 0	2	4
5 5 2	3	0 1 2 5 8
6 5 3 3 3 3 2	4	0 4 4 6 6
4 4 3 2 1 1 0	5	4 6 6 7
	6	1 8 9 9
1	7	8

Key : 3 | 5 means 35 minutes

(a) Write down the median time spent by Ben. [1]

(b) Find the mean time spent by Darren. [2]

(c) Based on the above data, without computing the mean time spent by Ben, state and explain who completed his homework faster over the period of 20 days.[1]

[Ans: (a) 44 minutes (b) 48.9 minutes (c) Ben]

8 **2015/Y1RP/EOY/SectB/Q1**

The frequency table shows the number of siblings the students in a CCA have.

Number of siblings	0	1	2	3	4
Number of students	3	p	12	8	6

(a) If the median number of siblings is 2, find the range of values of p. [2]

(b) One student who has 2 siblings is granted Leave of Absence from the school, and a returning Singaporean student who is an only child, joins the CCA. Given $p = 4$, calculate the new mean number of siblings the students in the CCA have. [2]

[Ans: (a) $0 \le p \le 22$ (b) $2\frac{8}{33}$]

9 **2014/Y1RP/MYCT/SectB/Q1**

The following stem and leaf diagram shows the number of times 12 boys updated their status on Facebook over the past 60 days.

Stem	Leaf
1	2
2	3 7 7
3	2 2 4 8
4	1 6 9
5	5

Key : 2 | 7 means 27 times

(a) Find the mean of the distribution, leaving your answer to 3 significant figures. [2]

(b) Find the percentage of boys who updated their status on Facebook at least 46 times over the past 60 days. [2]

[Ans: (a) 34.7 (b) 25%]

10 **2014/Y1RP/MYCT/SectB/Q2**

The following table shows the amount of money spent on MRT fare by some adults who boarded the North-South Line.

Amount spent ($)	1.10	1.30	1.40	1.70	2.00
Number of adults	15	x	9	7	5

(a) If the mode of the distribution is $1.30, write down the least value of x. [1]

(b) If the median of the distribution is $1.35, find the value of x. [2]

(c) If $x = 2$, write down the median of the distribution. [1]

[Ans: (a) 16 (b) 6 (c) $1.40]

11 **2013/Y1RP/EOY/SectB/Q5**

The scores of a class of 20 students in a test are shown in the stem-and-leaf diagram below.

Stem	Leaf
1	2 3 3
2	0 0 3 4 6 8 x
3	1 2 3 4 6 6 6 7
4	0 z

Given that the median score is 29.5 marks and the mean score is 28.1 marks, find the values of x and z. [3]

[Ans: $x = 8, z = 0$]

12 **2014/Y1RP/EOY/SectB/Q12**

The following stem and leaf diagram shows the marks of a group of students in a test.

Stem	Leaf
1	6 6 7 8
2	6 6 6 7 x 8
3	1 y 2 2 9
4	p

Key : 2 1 means 21 marks

(a) Given that the mode is 26 marks and the median is 27.5 marks, find the value of x and of y. [2]

(b) Using the values of x and y found in (a), express the mean mark in terms of p. [1]

(c) A student, who was previously absent, took the test and scored 36 marks. When his marks was added to the above stem and leaf diagram, the difference in the mean is 0.5, find the value of p. [2]

[Ans: (a) $x = 8, y = 1$ (b) $\frac{433+p}{16}$ (c) $p = 7$]

13 **2013/Y1RP/EOY/SectB/Q5**

The scores of a class of 20 students in a test are shown in the stem-and-leaf diagram below.

Stem	Leaf
1	2 3 3
2	0 0 3 4 6 8 x
3	1 2 3 4 6 6 6 7
4	0 z

Given that the median score is 29.5 marks and the mean score is 28.1 marks, find the values of x and z. [3]

[Ans: $x = 8, z = 0$]

14 **2013/Y1RP/EOY/SectB/Q8**

The table shows the number of movie tickets sold in a particular outlet from January to May.

Month	January	February	March	April	May
No. of movie tickets sold	120	135	$2x+3$	162	105

(a) If the mode is March and the data set is **not** bimodal, find the least value of x. [1]

(b) When the number of movie tickets for June and July are included, the mean number of tickets sold increases from 136 to 176. The ratio of the number of movie tickets in June and July is 7 : 5 . Find the number of movie tickets sold in June and July respectively. [3]

[Ans: (a) 80 (b) 322, 230]

15 **2012/Y1RP/MYCT/SectB/Q5**

36 students in a Year One class were asked how many times they visited the school library in a month. Their answers are given below.

5	4	3	2	6	5	3	0	1
6	2	7	3	5	4	6	3	2
3	5	6	4	0	2	5	1	3
7	2	3	5	2	4	4	3	4

(a) Complete the frequency table for the above information. [2]

Number of times students visited the school library	0	1	2	3	4	5	6	7
Frequency	2	2			6	6		

(b) Find the percentage of students who visited the library less than 4 times in a month. [2]

[Ans: 6, 8, 4, 2 (b) 50%]

16 **2012/Y1RP/MYCT/SectB/Q6**

Tickets for a show cost \$1, \$2, \$5 or \$20. The number of tickets sold at each price is shown in the table.

Ticket Price	\$1	\$2	\$5	\$20
Number of tickets sold	84	68	22	6

(a) Write down the modal price. [1]

(b) Find the median price. [1]

(c) Calculate the mean price. [2]

(d) Calculate the angle of sector in a pie chart which represents the number of tickets sold at \$5. [2]

[Ans: (a) \$1 (b) \$2 (c) \$2.50 (d) 44°]

17 **2012/Y1RP/EOY/SectB/Q6**

The amount of daily pocket money of students in a class of 30 is presented in the table below.

Daily Pocket Money in Dollars (\$)	5	6	7	8	9	10
Number of students	7	$2x$	3	5	x	3

Find

(a) the value of x, [1]

(b) the median amount of daily pocket money received by the students, [2]

(c) the mean amount of daily pocket money received by the students. [2]

[Ans: (a) $x = 4$ (b) \$6.50 (c) \$7]

18 **2011/Y1RP/MYCT/SectB/Q5**

A survey was conducted to find the number of books some students read last month.

Number of books	0	1	2	3	4
Number of students	6	7	5	2	x

(a) Find the largest possible value of x if the median number of books is 2. [1]

(b) Find the smallest possible value of x if the modal number of books is 4. [1]

(c) Given that the total number of students is 25, find the mean number of books read per student. [2]

[Ans: (a) 15 (b) 8 (c) $1\frac{18}{25}$]

19 **2011/Y1RP/MYCT/SectB/Q6**

The following stem and leaf diagram represents the Mathematics scores of 18 boys in a class.

Stem	Leaf
5	0 0 1 3
6	0 2 4 8
7	1 2 7
8	0 1 5 5 7
9	2 9

From the diagram, find

(i) the modal mark(s) obtained, [1]

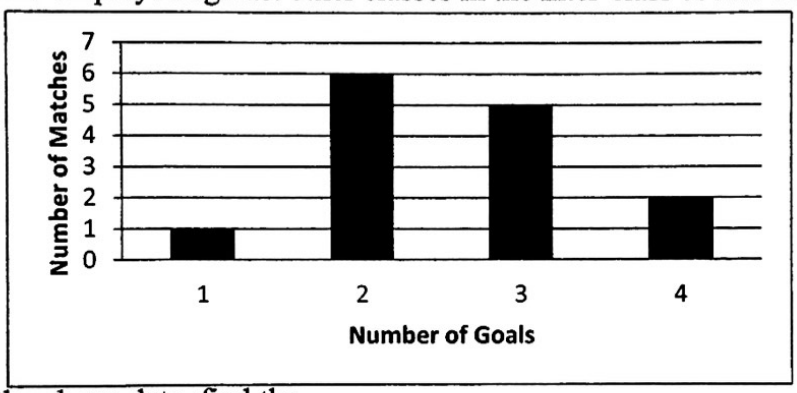
(ii) the median mark, [1]

(iii) the percentage of students who scored a distinction in Mathematics, given that a distinction is a score of at least 75 marks. [2]

[Ans: (i) 50 and 85 (ii) 71.5 (iii) $44\frac{4}{9}\%$]

20 **2011/Y1RP/EOY/SectB/Q4**

The following bar graph shows the number of goals scored in each of the 14 matches that class 1*Z* played against other classes in the inter-class soccer competition 2011.



For the above data, find the

(a) mode, [1]

(b) median, [1]

(c) mean. [2]

[Ans: (a) 2; (b) 2.5; (c) $2\frac{4}{7}$]

21 **2010/Y1RP/MYCT/SectB/Q1**

A gardener sowed 5 seeds into each of 100 plant pots. The number of seeds germinating in each pot was recorded and the results are given in the table below.

Number of seeds germinating	0	1	2	3	4	5
Number of pots	15	25	10	20	15	x

(a) State the value of x. [1]

(b) What fraction of the seeds germinated? [2]

(c) For this distribution, find the

(i) median, [1]

(ii) mode, [1]

(iii) mean. [2]

[Ans: (a) $x=15$ (b) $\frac{12}{25}$ (c)(i) 2.5 (ii) 1 (iii) 2.4]

22 **2010/Y1RP/MYCT/SectB/Q2**

The following stem and leaf diagram represents the scores of 20 students in an examination for two subjects, English and Chinese.

English Leaf					Stem	Chinese Leaf					
			5	3	3	9					
	8	6	6	6	4	6					
		7	6	3	5	2	3	7	9		
8	7	6	4	0	6	1	3	4	8		
8	7	5	4	2	7	0	2	2	5	7	9
				1	8	0	0	2	9		

(a) State the median score for Chinese. [1]

(b) State the modal score for English. [1]

(c) By looking at the stem and leaf diagram and without computing the actual mean scores for each subject, the Principal said that the students scored better for Chinese than for English. Do you agree with her? State your reason clearly. [1]

(d) If students who obtained less than 55 marks for Chinese must attend Chinese remedial, determine the percentage of students who must attend Chinese remedial. [1]

[Ans: (a) 69 (b) 46 (c) Yes. A lot more students scored above 80 for Chinese as compared to English (d) 20%]

23 **2010/Y1RP/EOY/SectB/Q4**

A six-faced die was thrown 28 times. The table shows the number of times that each possible score occurred.

Score	1	2	3	4	5	6
Frequency	8	6	6	2	x	2

(a) Find x. [1]

(b) Write down the modal score. [1]

(c) After the 27th throw, the median score was 2. Find the least possible score on the 28th throw. [1]

(d) The die was then thrown twice more. The mean score of all 30 throws was exactly 2.9. Find the sum of the scores of the extra two throws. [2]

[Ans: (a) $x=4$ (b)1 (c) 3 (d) 9]

24 **2009/Y1RP/EOY/SectB/Q4**

A group of pupils was asked how many hours they spent online each day. The results are shown in the following table.

No. of hours	0	1	2	3	4
Frequency	2	10	x	16	14

(a) If the mode is 3, state the greatest value of x. [1]

(b) Given that the total number of pupils is 60, calculate the

(i) value of x, [1]

(ii) median, [1]

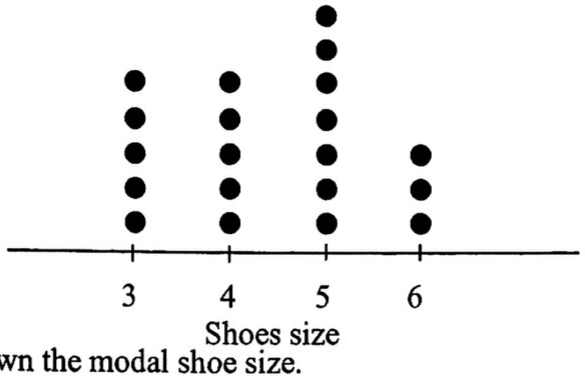
(iii) mean, [2]

(iv) percentage of pupils who spent between 1 and 3 hours inclusive online. [2]

[Ans: (a) $x=15$ (b)(i) $x=18$ (ii) 2.5 h (iii) 2.5 h (iv) $73\frac{1}{3}\%$]

25 **2008/Y1RP/EOY/SectB/Q2**

The following dot diagram shows the shoe sizes of 20 children.



(a) Write down the modal shoe size. [1]

(b) The data is to be represented on a pie chart. Calculate the angle of the largest sector. [2]

(c) Suppose x number of shoes of size 6 are now added to the data. By using the dot diagram or otherwise, find the maximum value of x such that the median shoe size is 5. [1]

[Ans: (a) 5 (b) 126° (c) 13]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 5: ALGEBRAIC EXPANSION AND FACTORISATION I

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

Note: ***For Section A (marked with asterisk), use of calculators is not allowed.***

1 **2020/Y1RP/EOY/Q7**

Expand and simplify $(5a-b)^2-(2b-3a)(7a+4b)$. [3]

[Ans: $46a^2-12ab-7b^2$*]*

2 **2020/Y1RP/EOY/Q8**

Factorise each of the following expressions completely.

(a) $10x-5y-2xy+y^2$, [2]

[Ans: $(2x-y)(5-y)$*]*

(b) $(4x+1)^2-81$, [3]

[Ans: $8(2x+5)(x-2)$*]*

(c) $8a^3+24a^2b+18ab^2$. [2]

[Ans: $2a(2a+3b)^2$*]*

3 **2020/Y1RP/EOY/Q10**

If $2x^2-2y^2=60$ and $x-y=6$, find the value of $(3x+3y)^2$. [2]

[Ans: 225]

4 **2019/Y1RP/EOY/Q13**

Expand and simplify the expression $(2a-b)^2-4a(a-2b)$. [2]

[Ans: $4ab+b^2$*]*

5 **2019/Y1RP/EOY/Q14**

Factorise completely,

(a) $2pq-4pr-q+2r$, [2]

(b) $(2x+1)^2-(x-4)^2$. [2]

[Ans: (a) $(q-2r)(2p-1)$ *(b)* $3(x-1)(x+5)$*]*

6 **2019/Y1RP/EOY/Q15**

Given that $9x^2-12xy+4y^2=0$, find the value of $\frac{2y}{x}$. [2]

[Ans: 3]

7 **2018/Y1RP/MYCT/SectA/Q8***

Factorise each of the following completely.

(a) $3m^4n-12m^2n^3$, [2]

(b) $5r(2p-3q)-(18q-12p)$. [2]

[Ans: (a) $3m^2n(m+2n)(m-2n)$ *(b)* $(2p-3q)(5r+6)$*]*

8 **2018/Y1RP/MYCT/SectB/Q2**

Factorise completely $16a^2-4b^2+20b-25$. [3]

[Ans: $(4a+2b-5)(4a-2b+5)$*]*

9 **2018/Y1RP/MYCT/SectB/Q6**

(a) Show that $(2x-3)^2+5x(x-6)+4(3x+4)$ can be simplified to $(3x-5)^2$. [2]

(b) Hence, find the value(s) of $(3x-5)$ if

$(4x-6)^2+20x(x-6)+16(3x+4)=1$. [3]

[Ans: (b) $\pm\frac{1}{2}$]

10 **2018/Y1RP/EOY/SectA/Q6***

(a) Expand and simplify $5x^2-8(2x-y)^2$. [2]

(b) Factorise completely $12x^2-3+36xy+27y^2$. [2]

[Ans: (a) $-27x^2+32xy-8y^2$ (b) $3(2x+3y+1)(2x+3y-1)$]

11 **2017/Y1RP/MYCT/SectA/Q7***

Factorise $x^2-xy-xz+yz$ completely. [2]

[Ans: $(x-y)(x-z)$]

12 **2017/Y1RP/MYCT/SectA/Q8***

Expand and simplify $5(x+2y)(3y-x)+(x-3y)^2$. [3]

[Ans: $-4x^2-xy+39y^2$]

13 **2017/Y1RP/MYCT/SectB/Q3**

Factorise each of the following expressions completely.

(a) $30p^2+18pq^2-15p^3$, [1]

(b) $20x^2-45y^2$, [2]

(c) $49a^2-4b^2+4b-1$. [3]

[Ans: (a) $3p(10p+6q^2-5p^2)$ (b) $5(2x+3y)(2x-3y)$ (c) $(7a+2b-1)(7a-2b+1)$]

14 **2017/Y1RP/EOY/SectB/Q1(b)**

(b) Given that $(x-y)^2=12$, find the exact value of $(3y-3x)^2$. [2]

[Ans: (b) 108]

15 **2017/Y1RP/EOY/SectB/Q9**

(a) Express the algebraic fraction $\frac{xy}{6x-5y}-\frac{5y^3+xy^2}{42xy-35y^2}$ as a single fraction in its simplest form. [4]

(b) Factorise $4-16x^2-36y^2+48xy$ completely. [3]

[Ans: (a) $\frac{y}{7}$ (b) $4(1-2x+3y)(1+2x-3y)$]

16 **2016/Y1RP/MYCT/SectA/Q8***

(a) Factorise $(1-7x)^2-7x+1$ completely. [2]

(b) (i) Expand and simplify $(5x+2)(2x-1)$. [1]

(ii) Using your result in part (i), evaluate 251×199. [2]

[Ans: (a) $(7x-1)(7x-2)$ or $(1-7x)(2-7x)$ (b)(i) $10x^2-x-2$ (ii) 49949]

17 **2016/Y1RP/MYCT/SectB/Q1**

Expand and simplify $(2x-3)^2-(3x-1)(4-5x)$. [3]

[Ans: $19x^2-29x+13$]

18 **2016/Y1RP/MYCT/SectB/Q3**

(a) Factorise p^4-1 completely. [2]

(b) For any integer p such that $p>1$, is it possible to find a value of p such that p^4-1 is a prime number? State your reason clearly. [1]

[Ans: (a) $(p^2+1)(p+1)(p-1)$ (b) No]

19 **2016/Y1RP/MYCT/SectB/Q4**

Factorise $4-4x^2+32xy-64y^2$ completely. [3]

[Ans: $4(1-x+4y)(1+x-4y)$]

20 **2016/Y1RP/EOY/SectB/Q3**

Factorise $3(a-2b)+3b(2b-a)^2$ completely. [3]

[Ans: $3(a-2b)(1+ab-2b^2)$]

21 **2016/Y1RP/EOY/SectB/Q11**

(a) Expand and simplify $\left(a+\frac{1}{a}\right)^2-\left(a-\frac{1}{a}\right)^2$. [2]

(b) Hence, find the values of $a-\frac{1}{a}$ if $\left(a+\frac{1}{a}\right)^2=53$. [2]

[Ans: (a) 4 (b) 7 or -7]

22 **2015/Y1RP/MYCT/SectB/Q6**

Factorise the following expressions completely.

(a) $pq-2pr+3qr-6r^2$, [2]

(b) $(2x+1)^2-4^2$, [2]

(c) $18a^3-12a^2b+2ab^2$. [2]

[Ans: (a) $(q-2r)(p+3r)$ (b) $(2x+5)(2x-3)$ (c) $2a(3a-b)^2$]

23 **2015/Y1RP/MYCT/SectB/Q7**

If $(2x-3y)^2=52$ and $2xy=17$, find the value of $8x^2+18y^2$. [3]

[Ans: 308]

24 **2015/Y1RP/EOY/SectB/Q3**

Factorise the following expressions completely.

(a) $a(a-1)-b(b-1)$, [3]

(b) $18a^3-60a^2b+50ab^2$. [2]

[Ans: (a) $(a-b)(a+b-1)$ (b) $2a(3a-5b)^2$)

25 **2014/Y1RP/MYCT/SectB/Q4**

Given that $(x-y)^2=15$ and $xy=-3$, find the exact value of

(a) x^2+y^2, [2]

(b) $(2x-2y)^2$. [2]

[Ans: (a) 9 (b) 60]

26 **2014/Y1RP/MYCT/SectB/Q5**

Express the algebraic fraction $\frac{2y}{3}-\frac{7}{15y}-\frac{7(3y-5)}{5y^2}$ as a single fraction in its simplest form. [4]

[Ans: $\frac{2y^3-14y+21}{3y^2}$]

27 **2014/Y1RP/MYCT/SectB/Q6**

Factorise each of the following completely.

(a) $(2a-3b)^2-(3a-2b)(2a-3b)$, [3]

(b) $2p^2q-5pq^2-2pr+5qr$, [3]

(c) $(x^2-4xy+4y^2)-9z^4$. [3]

[Ans: (a) $(3b-2a)(a+b)$ (b) $(2p-5q)(pq-r)$ (c) $(x-2y+3z^2)(x-2y-3z^2)$]

28 **2014/Y1RP/EOY/SectA/Q2***

Expand and simplify $(2p+q)(q-2r)-2p(q+r)$. [2]

[Ans: $q^2-2qr-6pr$]

29 **2014/Y1RP/EOY/SectB/Q5**

(a) Factorise $3a^2+6a+3$ completely. [2]

(b) Hence, find the smallest value of $3a^2+6a+5$. [1]

[Ans: (a) $3(a+1)^2$ (b) 2]

30 **2014/Y1RP/EOY/SectB/Q14(a)**

(a) Factorise $16a^2b^2-(ab+b)^2$ completely. [3]

[Ans: $b^2(5a+1)(3a-1)$]

31 **2013/Y1RP/MYCT/SectA/Q4***

(i) Expand and simplify $(3x-2)(5x+1)$. [2]

(ii) Using your result in (i), evaluate 298×501. [2]

[Ans: (i) $15x^2-7x-2$ (ii) 149298]

32 **2013/Y1RP/MYCT/SectB/Q4**

Given that $(2x-2y)^2=36$ and $4xy=12$, find the value of $2x^2+2y^2$. [3]

[Ans: 30]

33 **2013/Y1RP/MYCT/SectB/Q8**

Factorise the following completely.

(a) $3p^3q-27pq^3$, [3]

(b) r^2-16s^2-6r+9. [3]

[Ans: (a) $3pq(p-3q)(p+3q)$ (b) $(r-4s-3)(r+4s-3)$]

34 **2013/Y1RP/EOY/SectB/Q1**

Expand and simplify $(p+q)(q-r)-(p-q)(q+r)$. [2]

[Ans: $2q^2-2pr$]

35 **2013/Y1RP/EOY/SectB/Q2**

If $(a-b)^2=8$ and $ab=-2$, calculate the value of a^2+b^2. [2]

[Ans: 4]

36 **2013/Y1RP/EOY/SectB/Q3**

Factorise the following expressions completely.

(a) $5(3y-5)+2x(5-3y)$, [1]

(b) $49(x-y)^2-4y^2$. [3]

[Ans: (a) $(5-2x)(3y-5)$ (b) $(7x-5y)(7x-9y)$]

37 **2012/Y1RP/MYCT/SectB/Q1**

Expand and simplify $5(x-y)(2x+y)-2(x^2-y^2)$. [3]

[Ans: $8x^2-5xy-3y^2$]

38 **2012/Y1RP/MYCT/SectB/Q7**

(i) Simplify $\left(4n^2+1\right)^2-\left(4n^2-1\right)^2$. [2]

(ii) Three integers, a, b and c, are such that $a<b<c$.

The three integers are said to form a *Pythagorean Triple* if $c^2-b^2=a^2$.

For example, 8, 15, 17 forms a *Pythagorean Triple* because $17^2-15^2=8^2$.

By using the result in (a), or otherwise, find a *Pythagorean Triple* in which $a=100$ and b and c differ by 2. [3]

[Ans: (i) $16n^2$ (ii) 100, 2499 and 2501]

39 **2012/Y1RP/EOY/SectB/Q1**

Expand and simplify $4\left(\frac{x}{2}-y\right)\left(\frac{3x}{2}+2y\right)-(2x-3y)^2$. **[3]**

[Ans: $-x^2+10xy-17y^2$]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 6: ALGEBRAIC EQUATIONS I

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

Note: For Section A (marked with asterisk), use of calculators is not allowed.

1 **2020/Y1RP/EOY/Q11**

Make p the subject of the formula $m=\sqrt{\frac{m^2}{p}-\frac{3}{5}}$. [3]

[Ans: $p=\frac{5m^2}{5m^2+3}$]

2 **2020/Y1RP/EOY/Q13**

Solve the following simultaneous equations.

$3x+y=4$,

$\frac{x-3}{3y+2}=\frac{1}{4}$. [4]

[Ans: $x=2,\ y=-2$]

3 **2020/Y1RP/EOY/Q19**

A cyclist cycled from Station A to Station B and then to Station C. From Station A, he travelled $(x+2)$ km at an average speed of 30 km/h until he reached Station B. He reduced his average speed by 5 km/h for the remaining journey from Station B to Station C. He travelled a total distance of 25 km.

(i) Write down, in terms of x, an expression for the number of hours it took the cyclist to travel from Station A to Station B. [1]

(ii) Write down, in terms of x, an expression for the number of hours it took the cyclist to travel from Station B to Station C, leaving your answer in the simplest form. [1]

(iii) He took 20 minutes more to travel from Station B to Station C than from Station A to Station B. Form an equation in x and solve for x. [3]

(iv) Find the distance in km between Station B and Station C. [1]

[Ans: (i) $\frac{x+2}{30}$ hours (ii) $\frac{23-x}{25}$ hours (iii) $x=7\frac{1}{11}$ (iv) $15\frac{10}{11}$ km or 15.9 km]

4 **2019/Y1RP/EOY/Q16**

Make n the subject of the formula $m=\sqrt{\frac{3an-m}{n}}$. [3]

[Ans: $n=\frac{m}{3a-m^2}$]

5 **2019/Y1RP/EOY/Q18**

Solve the equation $\frac{2}{3x-1}-\frac{1}{2}=\frac{3}{4-12x}$. [4]

[Ans: $2\frac{1}{6}$]

6 **2019/Y1RP/EOY/Q21**

A bakery bakes x pineapple tarts and y peanut tarts daily in the ratio of 5 : 3.

(i) Form an equation connecting x and y. [1]

The pineapple tarts are packed into boxes of 30 while the peanut tarts are packed into boxes of 20. A total of 190 boxes of the tarts are baked everyday.

(ii) Form another equation connecting x and y. [1]

(iii) Hence, solve for x and y. [2]

[Ans: (i) $3x=5y$ *(ii)* $\frac{x}{30}+\frac{y}{20}=190$ *(iii)* $x = 3000, y = 1800$*]*

7 **2018/Y1RP/MYCT/SectA/Q3***

Make x the subject of the formula $\sqrt{\frac{y-3x}{x}}=\frac{a}{2b}$. [3]

[Ans: $x=\frac{4b^2y}{a^2+12b^2}$*]*

8 **2018/Y1RP/MYCT/SectB/Q3**

Solve the equation $\frac{6x}{2x-12}+\frac{5}{6-x}=\frac{3x^2}{(6-x)^2}$. [4]

[Ans: $1\frac{7}{23}$*]*

9 **2018/Y1RP/MYCT/SectB/Q7**

Kevin left home and headed for school which would start in an hour's time. After cycling for x minutes at a speed of 30 km/h, he experienced a flat tyre. He spent 30 minutes changing the tyre and then he continued the second part of the journey for $(x + 10)$ minutes at a speed of 24 km/h. The distance from his home to school was 17.5 km.

(a) Find, in terms of x,

(i) the distance travelled, in km, by Kevin in the first part of his journey before experiencing the flat tyre. [1]

(ii) the distance travelled, in km, in the second part of his journey. [2]

(b) Using your answers in **(a)(i)** and **(a)(ii)**, explain if Kevin would be late for school. [3]

[Ans: (a)(i) $\frac{x}{2}km$ *(ii)* $\left(\frac{2x+20}{5}\right)km$*]*

10 **2018/Y1RP/EOY/SectB/Q2**

Make p the subject of the formula $a+b=\frac{p^2-a^2}{p^2+b}$. [3]

[Ans: $p=\pm\sqrt{\frac{ab+b^2+a^2}{1-a-b}}$*]*

11 **2018/Y1RP/EOY/SectB/Q3**

Solve the equation $\frac{2x}{x-1}-4=\frac{1}{3(x-1)}$, where $x\neq k$, and state the value of k. [4]

[Ans: $x=1\frac{5}{6}$, $k = 1$*]*

12 **2018/Y1RP/EOY/SectB/Q5**

The following is a pair of simultaneous equations.

$$\frac{2x-1}{3}=\frac{3(y+1)}{5}+\frac{3}{2}$$

$$12x-10y=45$$

Given that $x=p+1$ and $y=q$ is the solution set of the above simultaneous equations, find the value of p and of q. [4]

[Ans: $p = 4$, $q = \frac{3}{2}$]

13 **2017/Y1RP/MYCT/SectA/Q10***

Make a the subject of the formula $y=\dfrac{a}{1+\dfrac{a}{x}}$. [3]

[Ans: $a=\dfrac{xy}{x-y}$]

14 **2017/Y1RP/MYCT/SectB/Q4**

The manager of a small company has some cash bonus to share with his employees.
If he gives $(x + 1)$ employees \$160 each, he will be short of \$80.
If he gives $(x + 10)$ employees \$70 each, he will have \$10 left over.

(a) Form an equation in x and solve it. [3]

(b) Find the amount of cash bonus that the manager has. [1]

(c) The manager distributed the entire cash bonus to 3 employees, Euclid, Fermat and Gauss. Euclid received \$$y$. Fermat received $\frac{2}{3}$ the amount Euclid received, while Gauss received $2\frac{1}{2}$ times the amount Fermat received. Form an equation in y and solve it. [2]

[Ans: (a) $x = 7$ (b) \$1200 (c) $y = 360$]

15 **2017/Y1RP/MYCT/SectB/Q5**

(a) Solve the equation $\dfrac{3x}{2x-6}=\dfrac{5}{3-x}$. [3]

(b) Below shows the first two steps of working in which a student was asked to solve an equation. Unfortunately, a drop of ink has smudged a number in the equation and the number cannot be seen. However, the second step of the working was clearly shown.

$$\frac{2x+1}{\blacksquare}=\frac{1-3x}{6}$$

Multiplying throughout by 12:

$$3(2x+1)=2(1-3x)$$

...

(i) Based on the second step of the working, deduce the missing number that was in the original equation. Write down the number in the box below. [1]

$$\frac{2x+1}{\square}=\frac{1-3x}{6}$$

(ii) Complete the working by solving the equation $3(2x+1)=2(1-3x)$ to find the value of x. [2]

[Ans: (a) $x=-3\frac{1}{3}$ (b)(i) 4 (ii) $x=-\frac{1}{12}$]

16 **2017/Y1RP/EOY/SectA/Q3***

Solve the following simultaneous equations [4]

$$\sqrt[3]{7x+2y}=-2,$$
$$7x-3y=7.$$

[Ans: $x=-\frac{2}{7}$ and $y=-3$]

17 **2017/Y1RP/EOY/SectB/Q8**

(a) Solve the equation $\frac{2a-17}{3a-9}=\frac{8-a}{12-4a}-2$. [3]

(b) Hence, or otherwise, solve the equation $\frac{2b-15}{3b-6}=\frac{7-b}{8-4b}-2$. [2]

[Ans: (a) $a=4$ (b) $b=3$]

18 **2016/Y1RP/MYCT/SectA/Q3***

Make x the subject of the formula $x^2-1=x^2y^2+y$ where $y<1$. [3]

[Ans: $x=\pm\frac{1}{\sqrt{1-y}}$]

19 **2016/Y1RP/MYCT/SectB/Q5**

Solve the following equations.

(a) $-3\left(\frac{7x-1}{6}-\frac{x}{3}\right)=2x\left(2-\frac{3}{x}\right)$, [3]

(b) $\frac{3x}{2x-10}+\frac{4}{5-x}=-\frac{3}{5}$. [3]

[Ans: (a) $x=1$ (b) $x=3\frac{1}{3}$]

20 **2016/Y1RP/MYCT/SectB/Q7**

In a theme park, there are two roller coaster rides A and B. The average speed of ride A is $(104-3x)$ m/s and this speed is 0.7 times the average speed of ride B. The time taken for ride B to travel 580 m is 4 seconds more than the time taken for ride A to travel **half** that distance.

(a) Write down and simplify an algebraic expression, in seconds, for
  (i) the time taken for ride A to travel **half** of 580 m, [1]
  (ii) the time taken for ride B to travel 580 m. [2]

(b) Form an equation in x and solve it. [3]

[Ans: (a)(i) $\frac{290}{104-3x}$ s (ii) $\frac{406}{104-3x}$ s (b) $x=25$]

21 **2016/Y1RP/EOY/SectA/Q3***

Solve the simultaneous equations.

$$8x-13y=-27$$
$$\frac{2}{x+y}=\frac{3}{2x-y}$$ [4]

[Ans: $x=-5$, $y=-1$]

22 **2016/Y1RP/EOY/SectB/Q1**

Make y the subject of the formula $\frac{2x-3}{5}=\frac{2y}{7-y}$. [3]

[Ans: $y=\frac{14x-21}{7+2x}$]

23 **2016/Y1RP/EOY/SectB/Q10**

(a) Solve $\frac{5}{2p-1}-\frac{4}{4p-2}=2-\frac{3}{3-6p}$. [2]

(b) **Hence**, find the value of q in the equation $\frac{5}{q-1}+\frac{3}{3-3q}=2+\frac{4}{2q-2}$. [2]

[Ans: (a) $p = 1$ (b) $q = 2$]

24 **2015/Y1RP/EOY/SectB/Q4**

Make y the subject of the formula $\frac{1}{x}+\frac{3}{2y}=\frac{4}{5z}$. [3]

[Ans: $\frac{15xz}{2(4x-5z)}$]

25 **2015/Y1RP/EOY/SectB/Q5**

Solve the equation $\frac{4}{3y-5}-\frac{y-2}{2(5-3y)}=\frac{2}{7}$. [3]

[Ans: $12\frac{2}{5}$]

26 **2015/Y1RP/EOY/SectB/Q6**

(a) Solve $\frac{3x}{4}-\frac{2(x-1)}{3}=1-\frac{2x+3}{6}$. [2]

(b) **Hence**, find the value of a in the equation $\frac{3(a+1)}{4}-\frac{2a}{3}+\frac{2a+5}{6}=1$. [1]

[Ans: (a) $-\frac{2}{5}$ (b) $-1\frac{2}{5}$]

27 **2014/Y1RP/MYCT/SectA/Q8***

Solve the following equations.

(a) $-2(\frac{x}{6}-5)=8(1-\frac{x}{3})$, [3] (b) $\frac{x}{3x-4}+\frac{2}{4-3x}=-\frac{3}{4}$. [3]

[Ans: (a) $-\frac{6}{7}$ (b) $1\frac{7}{13}$]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 7: LINEAR INEQUALITIES

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

Note: ***For Section A and Paper 1 (marked with asterisk), use of calculators is not allowed.***

1 **2020/Y1RP/EOY/Q12**

Solve the inequalities $\frac{1}{3}x-\frac{1}{4}<2x+1\le 2.5-x$. [3]

[Ans: $-\frac{3}{4}<x\le\frac{1}{2}$*]*

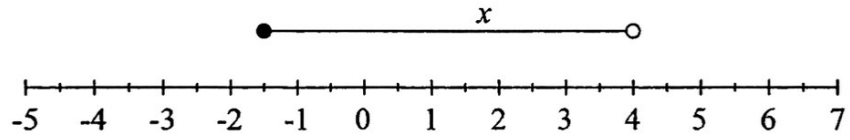
2 **2019/Y1RP/EOY/Q17**

Solve the inequality $\frac{3x-11}{2}\le 5x+12\le 8(x+5)-7$. [3]

[Ans: $x\ge -5$*]*

3 **2018/Y1RP/EOY/SectA/Q3***

The number line represents the solution to the inequality $a\le 2x-5<b$. Find the values of a and b. [3]



[Ans: $a=-8,\ b=3$*]*

4 **2017/Y1RP/EOY/SectA/Q4***

(a) Solve the inequality $-\frac{1}{3}x-3\le\frac{2}{3}x-\frac{7}{2}\le-\frac{4}{3}x+\frac{5}{2}$. [3]

(b) Hence, solve the inequality $-\frac{1}{3x}-3\le\frac{2}{3x}-\frac{7}{2}\le-\frac{4}{3x}+\frac{5}{2}$. [1]

[Ans: (a) $\frac{1}{2}\le x\le 3$ *(b)* $\frac{1}{3}\le x\le 2$*]*

5 **2016/Y1RP/EOY/SectA/Q4***

(a) Solve the inequality $x-8<4x-1\le 2x+9$.
Draw a number line to represent the solution of x which satisfy $x-8<4x-1\le 2x+9$. [3]

(b) Given that p and q are two integer values selected from part (a), and $p\ne q$.
Find the greatest value of p^2-q. [1]

[Ans: (a) $-2\frac{1}{3}<x\le 5$ *(b) 27]*

6 **2015/Y1RP/EOY/SectA/Q8***

Solve the following inequality $\frac{15}{2}-4x\le 2-\frac{3(x-3)}{2}<\frac{91-11x}{4}$.

Hence list the prime numbers which satisfy the above inequality. [4]

[Ans: 2, 3, 5, 7, 11]

7 **2014/Y1RP/EOY/SectA/Q5***

Solve the inequality $-5 < \frac{3x+5}{2} \le 4x-3$. [3]

[Ans: $x \ge 2\frac{1}{5}$]

8 **2013/Y1RP/EOY/SectB/Q13**

(a) Solve the inequality $\frac{1}{2}(x+4) < \frac{1}{3}(x+7) < 1-x$, illustrating your solution on a number line. [3]

(b) It is given that x is an integer such that $-8 \le x < 4$ and y is an integer such that $-5 \le \frac{1}{y} < -0.\dot{1}$. Find the smallest possible value of $\frac{y}{x}$. [2]

[Ans: (a) $x < -1$ (b) -8]

9 **2012/Y1RP/EOY/SectB/Q11**

Solve the inequality $\frac{2}{3} < \frac{8}{3} - \frac{2y}{9} \le \frac{4}{9}(17-3y)$ and hence list all the possible **prime value(s)** of y. [4]

[Ans: $y \le 4.4$, 2 and 3]

10 **2011/Y1RP/EOY/SectA/Q2***

Find the range of values of x which satisfies $x-17 \le 2x-1 < \frac{1}{3}(3-12x)$. [3]

[Ans: $-16 \le x < \frac{1}{3}$]

11 **2011/Y2RP/MYCT/Q9**

Solve $3x+2 \le \frac{7x+6}{5} < 2x+7$. [4]

[Ans: $-9\frac{2}{3} < x \le -\frac{1}{2}$]

12 **2011/Y2RP/EOY/Q2**

Solve the inequality $-7x-6 < \frac{2x+5}{3} \le 5x-1$. [4]

[Ans: $x \ge \frac{8}{13}$]

13 **2011/Y3RP/MYCT/Q3**

Solve the following inequality $x+1 < 2x-3 < 3x-1$. [3]

[Ans: $x > 4$]

14 **2010/Y3RP/MYCT/Q11(a)**

Solve the inequality $\frac{1}{3}x - \frac{3}{2} < x-1 \le \frac{1}{4}x + \frac{2}{3}$. [3]

[Ans: $-\frac{3}{4} < x \le 2\frac{2}{9}$]

15 **2005/Y3RP/CT1/Q1**

Solve the inequality $2 - \frac{x}{3} \le 8 + \frac{3x}{2} < \frac{x+67}{4}$. [3]

[Ans: $-3\frac{3}{11} \le x < 7$]

16 **2005/Y3RP/CT1/Q4**

Given that $-6 \le x \le 4$ and $2 \le y \le 8$, showing your workings clearly, find

(a) the smallest possible value of $\frac{x}{y}$, [1]

(b) the smallest possible value of $4x^2 - 12xy + 9y^2$, [2]

[Ans: (a) –3 (b) 0]

17 **2004/S4EM/P1/Q14***

By solving the inequality, find the prime numbers m such that

$$\frac{m+2}{4} \le \frac{2m-1}{2} + \frac{2}{3} < 3\frac{1}{2}.$$ [4]

[Ans: 2, 3]

18 **2003/S3EM/EOY/P1/Q1***

Find all the prime values of y for which $-5 < 4 - \frac{2y-3}{3} \le -1$. [3]

[Ans: 11, 13]

19 **2003/S3EM/EOY/P1/Q2***

Given that $-1 \le a \le 5$ and $4 \le b \le 7$, find

(a) the smallest value of $\frac{a}{b-3}$, [1]

(b) the largest value of $b^2 - 2a^2$, [1]

(c) the smallest value of $ab - 2a$. [1]

[Ans: (a) –1 (b) 49 (c) –5]

20 **2003/S4EM/CT2/Q1**

If x is a whole number for which $3x - 1 < 2x + 3 \le 7 + 5x$, list the possible values of x . [2]

[Ans: 0, 1, 2, 3]

21 **2003/S4EM/P2/Q2(a)**

Solve the inequality $x + 6 \le 2 - 3x \le 23$. Given further that $-3 \le y \le 5$, find

(i) the smallest possible value of $\frac{y}{x}$,

(ii) the largest possible value of $xy^2 - x$. [5]

[Ans: $-7 \le x \le -1$ (i) –5 (b) 7]

22 **2002/S3EM/EOY/P1/Q3***

Solve the inequality $\frac{2-5x}{4} \le \frac{4x+7}{12} < \frac{x+7}{6}$. [4]

[Ans: $-\frac{1}{19} \le x < 3\frac{1}{2}$]

23 **2002/S3EM/EOY/P1/Q2***

Given that $-5 \le x \le 2$ and $-3 \le y \le 7$, find

(a) the greatest possible value of $y - 2x$, [1]

(b) the least possible value of $\frac{y}{x-3}$, [1]

(c) the greatest possible value of $x^2(y+1)$. [1]

[Ans: (a) 17 (b) –7 (c) 200]

24 **2002/S4EM/P1/Q10***

Find all the integer values of x for which $5x - 11 < 17 - 2x \le x + 22$. [3]

[Ans: –1, 0, 1, 2, 3]

25 **2002/S4EM/P2/Q2(b)**

Given that $-3 \le x \le 8$ and $-6 \le y \le -2$, find

(i) the least possible value of $x^2 - y^2$, [1]

(ii) the greatest possible value of $\frac{x}{y}$. [1]

[Ans: (i) –36 (ii) $1\frac{1}{2}$]

26 **2001/S3EM/EOY/SectA/Q1***

Find the prime numbers x for which $23 - x \le 2x + 21 < 31$. [3]

[Ans: 2, 3]

27 **2001/S3EM/EOY/SectA/Q3***

Given that $-3\frac{1}{4} \le p \le 2$ and $-1\frac{1}{3} \le q \le 6$, find

(a) the smallest value of $3pq$ where p and q are integers,

(b) the largest value of $\frac{p+q}{p}$ where p is an integer,

(c) the largest value of $16p^2 + 9q^2 - 24pq$.

[4]

[Ans: (a) −54 (b) 7 (c) 961]

28 **2001/S4EM/P1/Q17***

List the integral values of k which satisfy $8 < 2(2k-1) - 15 \le 2k + 1$. [4]

[Ans: 7, 8, 9]

29 **2000/S3EM/EOY/SectA/Q2***

Given that a and b are integers such that $-3 \le a < 2$ and $1 \le b < 6$, find

(a) the largest possible value of $b - 4a$, [1]

(b) the smallest possible value of $\frac{a+1}{2b}$, [1]

(c) the smallest possible value of $a^2 + b^2$. [1]

[Ans: (a) 17 (b) –1 (c) 1]

30 **2000/S3EM/EOY/SectA/Q5***

Find the prime values of x for which $5\left(\frac{x}{2} - 8\right) \le \frac{9-3x}{2} \le \frac{15-x}{4} - \frac{x}{2}$. [4]

[Ans: $x = 2, 3, 5, 7, 11$]

31 **2000/S4EM/P1/Q17(a)***

Solve the inequality $2 - 3q < 8 + 7q$.

[Ans: $q > -\frac{3}{5}$]

32 **1999/S3EM/EOY/SectA/Q11***

Given that a and b are such that $-3 \le \frac{2a-7}{3} \le 3$ and $-35 \le 5 - 4b \le -19$, find

(a) the largest possible value of $\frac{2a}{b+1}$,

(b) the smallest possible value of $a^2 - 2b$.

[Ans: (a) $2\frac{2}{7}$ (b) −20]

33 **1999/S4EM/P1/Q13***

(a) Find the range of values of x which satisfy the inequalities

$$-2x \le -3x + 7 \le x \ .$$ [2]

(b) In addition, if $x - 2\frac{2}{3} < 0$, find the range of values of x . [1]

[Ans: (a) $1\frac{3}{4} \le x \le 7$ *(b)* $1\frac{3}{4} \le x < 2\frac{2}{3}$ *]*

34 **1998/S4EM/P1/Q11(a)***

Find the integer x such that $2x + 1 < 9 \le 5x - 2$. [2]

[Ans: 3]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 8: ANGLE PROPERTIES

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

1 **2020/Y1RP/EOY/Q15**

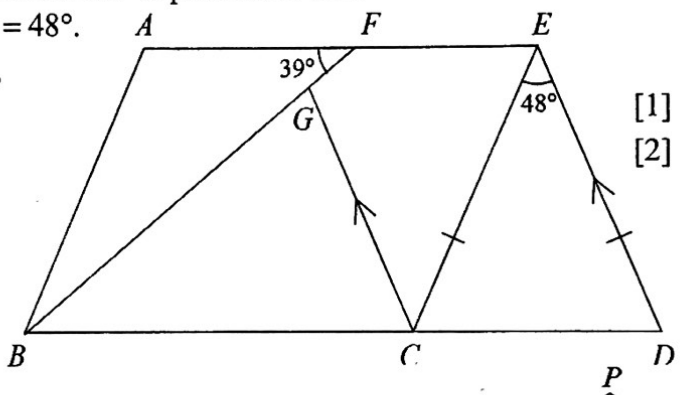
(a) A 18-sided polygon has three interior angles of 159°, 149° and 142°, and the remaining interior angles are each $x°$. Find the value of x. [2]

(b) The exterior angle of a regular 15-sided polygon is 4° more than the exterior angle of a regular n-sided polygon. Find the value of n. [2]

[Ans: (a) $x = 162$ (b) $n = 18$]

2 **2019/Y1RP/EOY/Q19**

The figure is made up of a parallelogram $ABCE$ and an isosceles triangle CDE with $CE = DE$. G is a point on BF such that CG is parallel to DE.
Angle $AFB = 39°$ and angle $CED = 48°$.



Find, stating the reason(s) clearly,

(i) angle BCG, [1]

(ii) angle FGC. [2]

[Ans: (i) 66° (ii) 105°]

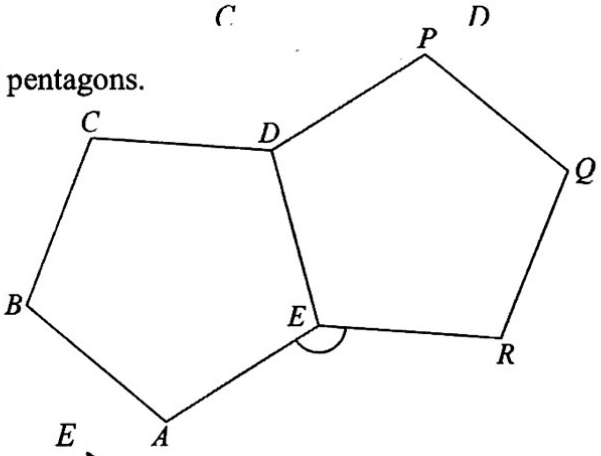
3 **2019/Y1RP/EOY/Q23**

The diagram is made up of two regular identical pentagons.

(i) Calculate angle AER. [2]

(ii) Another two regular identical pentagons are placed adjacent to sides RQ and AB respectively. If this process were to be repeated, explain whether a closed ring will eventually be formed. [1]

[Ans: (i) 144° (ii) Possible]



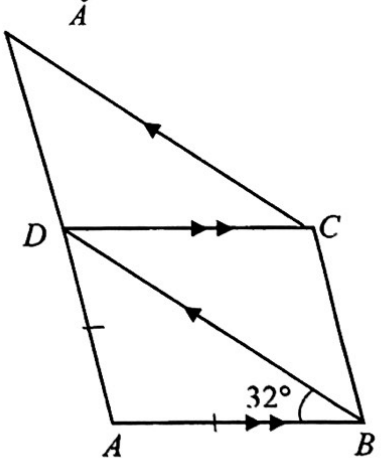
4 **2018/Y1RP/EOY/SectB/Q4**

In the diagram, ADE is a straight line. EC is parallel to DB, DC is parallel to AB and $AB = AD$. Angle $ABD = 32°$. Find, stating your reasons clearly,

(i) angle BAD, [1]

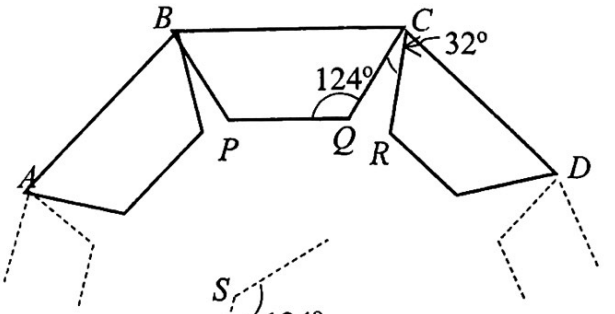
(ii) reflex angle AEC. [2]

[Ans: (i) 116° (ii) 328°]



5 **2018/Y1RP/EOY/SectB/Q6**

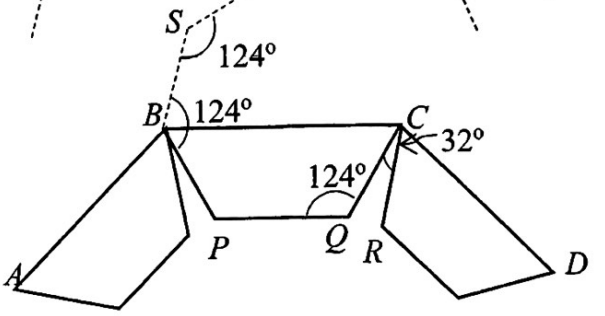
The diagram, not drawn to scale, shows part of a regular n-sided polygon, $ABCD\ldots$.
Identical isosceles trapeziums are on each side of the polygon. Angle $PQC = 124°$ and angle $QCR = 32°$.



(a) Find the value of n. [3]

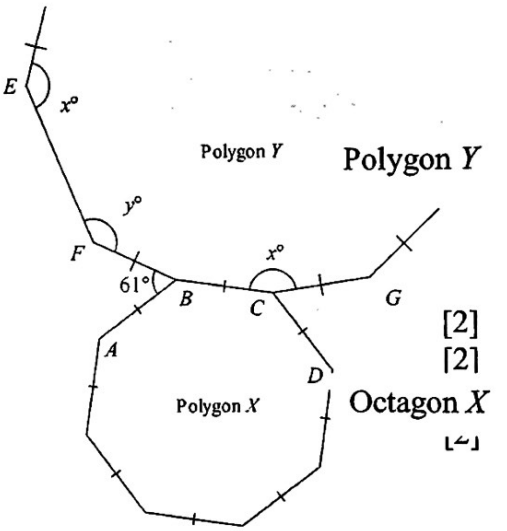
(b) If $CQPBS\ldots$ is to be part of another regular m-sided polygon, explain whether the regular m-sided polygon $CQPBS\ldots$ exists. [1]

[Ans: (a) 10 (b) does not exist]



6 **2017/Y1RP/EOY/SectB/Q5**

The diagram below (not drawn to scale) shows a regular octagon X with four consecutive vertices A, B, C, D and an n-sided polygon Y with adjacent sides EF, FB, BC and CG. The sides of polygons X and Y are equal in length **except** for the line segment EF. Polygon Y has one interior angle of $y°$ while the rest of the interior angles are of $x°$ each.



(a) Find the value of x. [2]

(b) **(i)** Express y in terms of n. [2]

(ii) Hence, determine the maximum value of n.

[Ans: (a) $x = 164$ (b)(i) $y = 16n - 196$ (ii) 23]

7 **2017/Y1RP/EOY/SectB/Q6**

The angles of a quadrilateral $ABCD$ are represented by the following expressions:

angle $A = (2x + 76)°$, angle $B = (10x - 44)°$, angle $C = (4x)°$ and angle $D = (120 - 3x)°$.

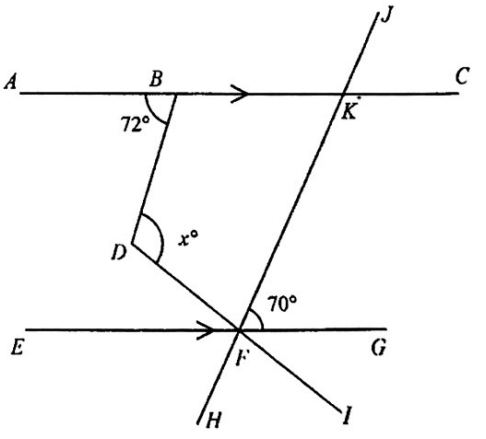
(a) Find the value of x. [2]

(b) By showing your working and reasoning clearly, deduce the name of the quadrilateral. [2]

[Ans: (a) $x = 16$ (b) Trapezium]

8 **2016/Y1RP/EOY/SectB/Q6**

In the diagram, AC is parallel to EG. B lies on AC and DFI is a straight line such that $\angle ABD = 72°$. JH intersects AC and EG at K and F respectively. JH is the angle bisector of $\angle DFG$ and $\angle KFG = 70°$.



Find, stating your reasons clearly,

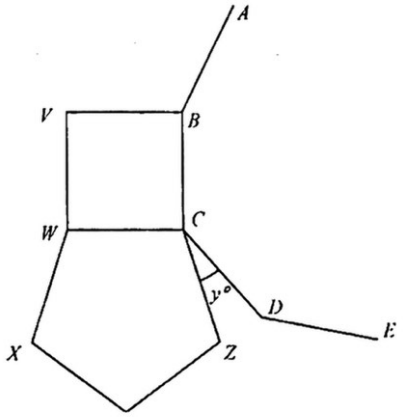
(a) $\angle FKC$,

(b) the value of x.

[Ans: (a) 110° (b) 112]

9 **2016/Y1RP/EOY/SectB/Q9**

In the diagram, *WXYZC* is a regular pentagon and *BCWV* is a square. *ABCDE* is part of a regular *n*-sided polygon. $\angle DCZ = y^\circ$.



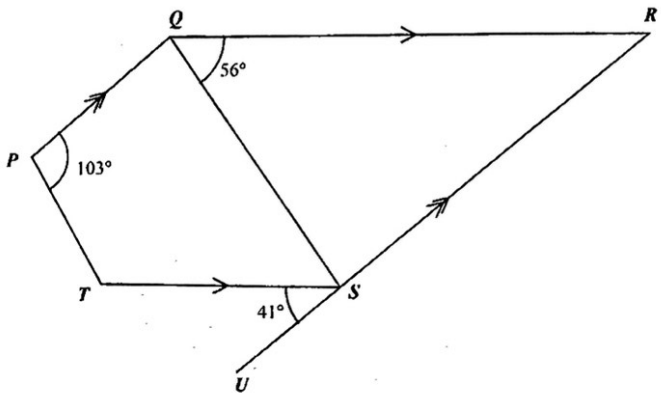
(a) Find the value of *n* when $y = 6$. [3]

(b) Explain clearly if it is possible for $n = 24$. [1]

[Ans: (a) n = 15 (b) not possible]

10 **2015/Y1RP/EOY/SectB/Q12**

In the diagram, *PQ* is parallel to *USR* and *QR* is parallel to *TS*. Given $\angle RQS = 56°$, $\angle TSU = 41°$ and $\angle QPT = 103°$. Calculate



(a) $\angle QRS$, [1]

(b) $\angle PQS$. [2]

(c) State, showing your reasoning, whether *PT* is parallel to *QS*. [1]

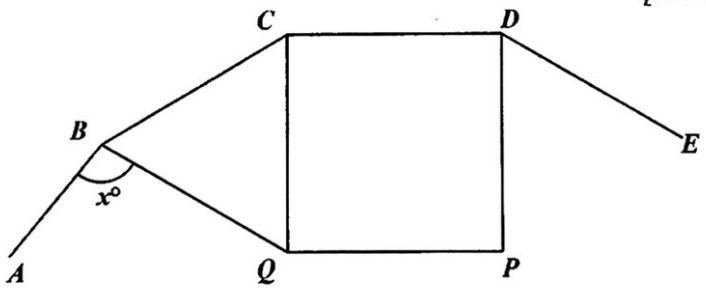
[Ans: (a) 41° (b) 83° (c) not parallel]

11 **2015/Y1RP/EOY/SectB/Q13**

(a) The interior angle of a regular polygon is 165°. How many sides does it have? [1]

(b) *ABCDE...* is part of a regular polygon which has interior angles of 165°. *CDPQ* is a square. Find the value of *x*. [3]

[Ans: (a) 24 (b) 112.5]



12 **2014/Y1RP/EOY/SectB/Q1**

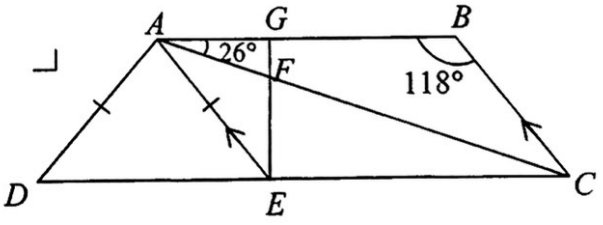
Each interior angle of a regular polygon with 9 sides is 32° more than each interior angle of another regular polygon with *n* sides. Name this *n*-sided polygon. [3]

[Ans: Pentagon]

13 **2014/Y1RP/EOY/SectB/Q10**

The figure shows a trapezium *ABCD* such that *AB* // *DC*, $\angle BAC = 26°$ and $\angle ABC = 118°$. *E* lies on *DC* such that *AE* is parallel to *BC*. It is given that *AD* = *AE* and *G* is the foot of the perpendicular from *E* to *AB* such that *EG* meets *AC* at *F*.

Find, stating your reason(s) clearly,



(a) $\angle EFC$, [2]

(b) $\angle DAC$. [2]

[Ans: (a) 64° (b) 92°]

14 **2013/Y1RP/EOY/SectB/Q4**

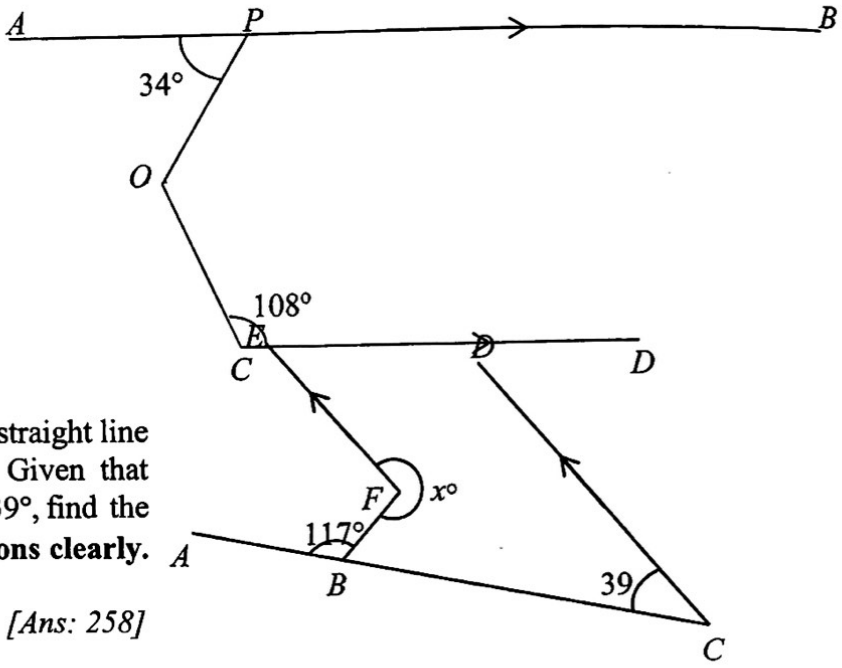
Given that each exterior angle of a regular polygon is 30°, find the sum of the interior angles of the polygon. [3]

[Ans: 1800°]

15 **2013/Y1RP/EOY/SectB/Q7**

In the figure below, *APB* is a straight line and the line *AB* is parallel to *CD*. Find the obtuse $\angle PQC$, **stating all your reasons clearly.** [3]

[Ans: 106°]



16 **2012/Y1RP/EOY/SectB/Q7**

In the figure below, *ABC* is a straight line and *CD* is parallel to *FE*. Given that $\angle ABF = 117°$ and $\angle ACD = 39°$, find the value of *x*, **stating your reasons clearly.** [3]

[Ans: 258]

17 **2012/Y1RP/EOY/SectB/Q8**

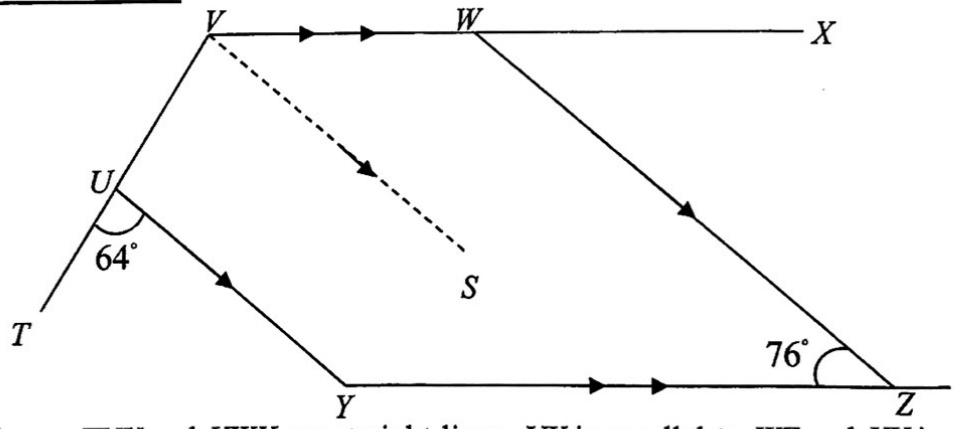
A regular polygon *X* has *n* sides while a regular polygon *Y* has $(2n-3)$ sides. If the ratio of each **exterior** angle of the polygon *X* to that of the polygon *Y* is 5 : 3, find

(a) the value of *n*, **[2]**

(b) the size of each **interior** angle of polygon *Y*. **[2]**

[Ans: (a) n = 9 (b) 156°]

18 **2011/Y1RP/EOY/SectB/Q1**



In the figure above, *TUV* and *VWX* are straight lines. *UY* is parallel to *WZ* and *VX* is parallel to *YZ*. Given that $\angle TUY = 64°$ and $\angle WZY = 76°$, find

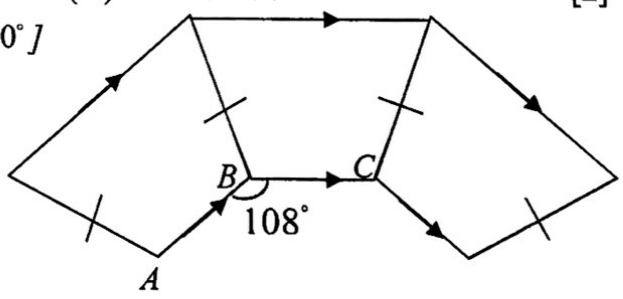
(i) $\angle YUV$, [1] (ii) $\angle UYZ$, [1]

(iii) $\angle XWZ$, [1] (iv) $\angle UVW$. [2]

[Ans: (i) 116° (ii) 104° (iii) 76° (iv) 140°]

19 **2011/Y1RP/EOY/SectB/Q12**

(a) The size of each interior angle of a regular polygon is 5 times the size of each exterior angle. Calculate the size of each exterior angle. [2]



(b) The figure shows 3 identical isosceles trapeziums. In the figure, $\angle ABC = 108°$. Additional identical isosceles trapeziums are added to the 3 existing ones to form a closed ring. How many more identical isosceles trapeziums are needed to complete the ring? [3]

(Solution to this question by scale drawing will not be accepted.)

[Ans: (a) 30° ; (b) 2]

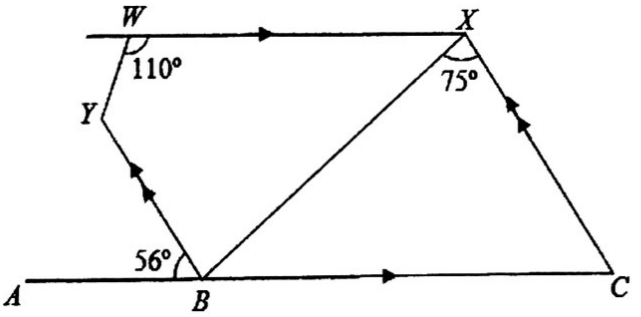
20 **2010/Y1RP/EOY/SectB/Q2**

In the diagram, the straight line ABC is parallel to WX and BY is parallel to CX. $\angle ABY = 56°$, $\angle XWY = 110°$ and $\angle BXC = 75°$. Calculate

(i) $\angle BXW$, [2]

(ii) $\angle WYB$. [2]

[Ans: (i) 49° (ii) 126°]



21 **2010/Y1RP/EOY/SectB/Q8**

(a) Four of the interior angles of a 12-sided polygon are each $x°$ and the remaining interior angles are each 160°. Calculate the value of x. [3]

(b) Each exterior angle of a regular polygon with 18 sides is 16° less than each exterior angle of a regular polygon with n sides. Calculate the value of n. [2]

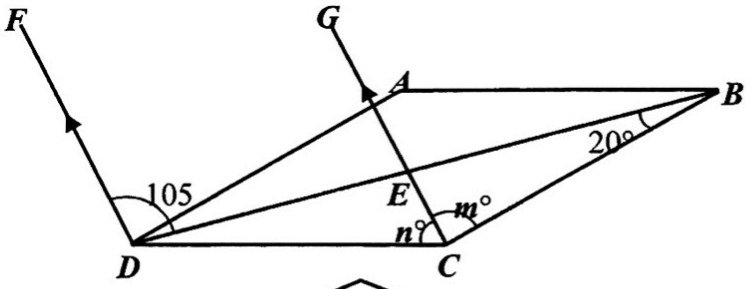
[Ans: (a) 130 (b) 10]

22 **2009/Y1RP/EOY/SectB/Q10**

In the diagram, BD is the diagonal of the rhombus $ABCD$. Explain clearly why $\angle ADB = \angle BDC$. [1]

Given that E is a point of intersection of BD and CG, DF // CG, CG is a straight line, $\angle EBC = 20°$ and $\angle BDF = 105°$, find the values of m and n. State clearly the angle properties used. [4]

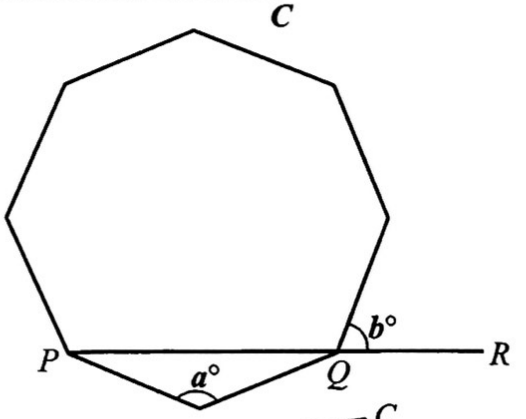
[Ans: $m = 85$, $n = 55$]



23 **2009/Y1RP/EOY/SectB/Q11**

The diagram shows a regular octagon and straight line PQR passing through the vertices P and Q. Calculate the values of a and b. [3]

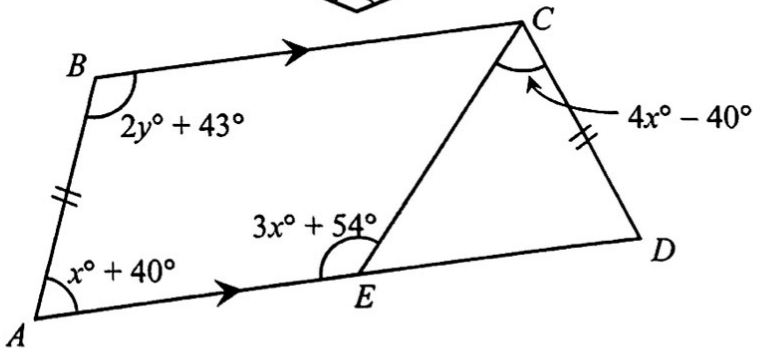
[Ans: $a = 135$, $b = 67.5$]



24 **2008/Y1RP/EOY/SectB/Q6**

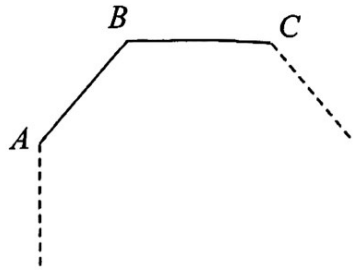
In the diagram below, $ABCD$ is an isosceles trapezium with AD parallel to BC and E is a point on the side AD. Find the values of x and y. [4]

[Ans: $x = 27$, $y = 35$]



25 **2008/Y1RP/EOY/SectB/Q7**

A, B and C are three consecutive vertices of a regular octagon. Find the size of reflex angle BCA. [4]

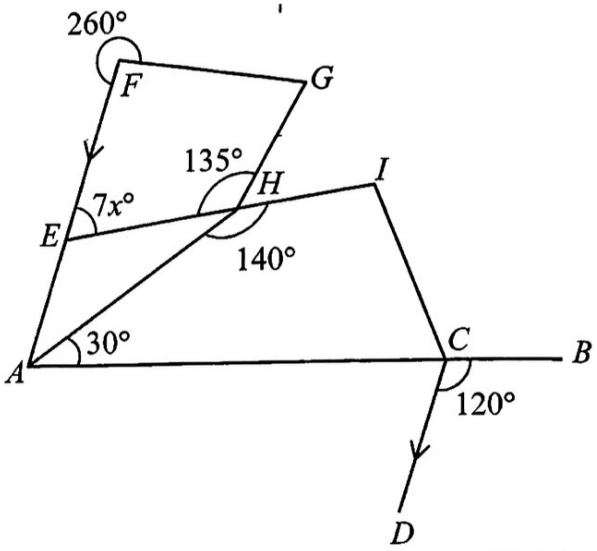


[Ans: 337.5°]

26 **2007/Y1RP/EOY/SectB/Q12**

In the diagram below, AEF, EHI and ACB are straight lines. Given also that FA is parallel to CD. Find the value of x and hence find reflex $\angle FGH$. [4]

[Ans: $x = 10$; reflex $\angle FGH = 305°$]



27 **2007/Y1RP/EOY/SectB/Q13**

The exterior angles of a polygon are 10°, $2x$°, 30°, $4x$°, 50°, $6x$°, 70° and $8x$°. Find the ratio of the smallest interior angle to the sum of all the interior angles of the polygon. [4]

[Ans: 5 : 54]

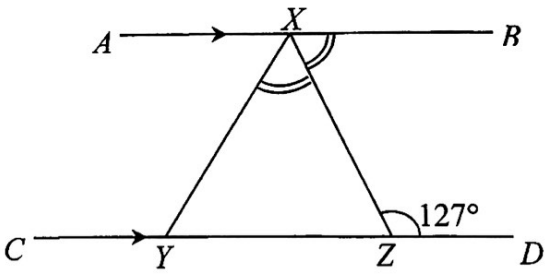
28 **2006/Y1RP/CT2/Q1**

In the diagram below, AB // CD, AXB and $CYZD$ are straight lines. $\angle DZX = 127°$ and the line XZ bisects $\angle BXY$. Stating your reasons clearly, find

(i) $\angle BXZ$, [1]

(ii) $\angle XYZ$. [1]

[Ans: (i) 53° (ii) 74°]



29 **2006/Y1RP/CT2/Q10**

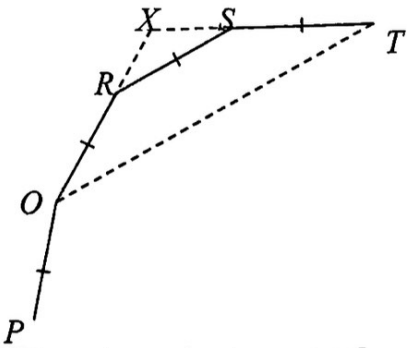
PQ, QR, RS and ST are adjacent sides of a 15-sided regular polygon. Calculate

(i) an interior angle of the polygon, [2]

(ii) $\angle RXS$, [2]

(iii) $\angle STQ$. [1]

Hence, by deductive reasoning, state the name of the quadrilateral $QRST$. [1]



[Ans: (i) 156° (ii) 132° (iii) 24° QRST is an isosceles trapezium]

30 **2006/Y2RP/CT2/Q4**

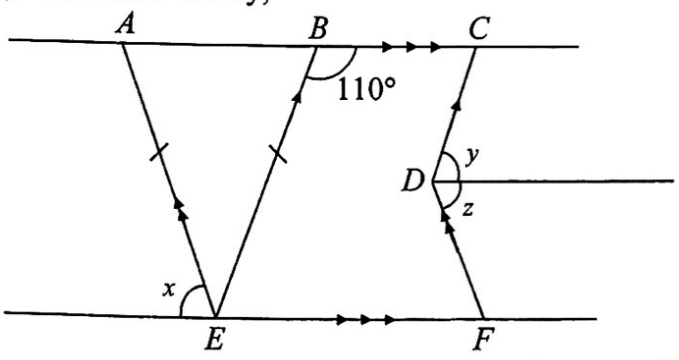
A polygon has n sides. If one of its interior angles is 96° and the other interior angles are each equal to 168°, find the value of n. [3]

[Ans: $n = 24$]

31 **2006/Y2RP/CT2/Q8**

In the diagram, ABE is an isosceles triangle with $AE = BE$ and $\angle EBC = 110°$. The straight line ABC is parallel to line EF, DC is parallel to EB and FD is parallel to EA. Calculate, stating your reasons clearly,

(a) $\angle AEB$,
(b) $\angle DFE$,
(c) $\angle CDF$.



[5]

[Ans: (a) 40° (b) 70° (c) 140°]

32 **2005/Y2RP/CT1/Q2**

Each exterior angle of a regular polygon of n sides is 16° greater than each exterior angle of another regular polygon of $3n$ sides.

(a) Form an equation in n and solve for the value of n. [2]

(b) Calculate the interior angle of the regular polygon of $3n$ sides. [1]

[Ans: (a) $\frac{360°}{n} = \frac{360°}{3n} + 16°$; $n = 15$ *(b) 172°]*

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 9: ARITHMETIC PROBLEMS

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

Note: ***For Section A (marked with asterisk), use of calculators is not allowed.***

1 **2020/Y1RP/EOY/Q16**

Mark deposited $\$x$ in a bank that offered 1.6% compound interest per annum, compounded quarterly. At the end of 5 years, he collected \$1994.74 in interest. Find the value of x, correct to the nearest hundred dollars. [3]

[Ans: $x = 24000$]

2 **2020/Y1RP/EOY/Q17**

(a) A map is drawn to a scale of $1:n$. A reservoir with actual area of 45 km^2 is represented by an area of 7.2 cm^2 on the map. Find the value of n. [2]

(b) Given that y is inversely proportional to the square of x, find the required change in x for y to be decreased by 75%. [2]

[Ans: (a) $n = 25000$ (b) x is doubled]

3 **2020/Y1RP/EOY/Q18**

A shop purchased 440 pens at \$8.50 each. The marked price of each pen is 200% above the cost price. In June, the shop sold 125 pens at the marked price, and during a **sale** it sold 280 pens at a discount of 10% off the marked price. The shop gave the remaining pens free to its staff.

(i) John bought a pen at the **sale**. Find the amount he has to pay correct to the nearest cent. [2]

(ii) Find the percentage profit the shop made on the 440 pens in June, correct to 1 decimal place. [3]

[Ans: (i) \$22.95 (ii) 157.0%]

4 **2019/Y1RP/EOY/Q5**

Miss Hosanna invested \$6700 in a fund that pays 2.5% compound interest per annum, compounded every half-yearly. Calculate the amount of money Miss Hosanna has at the end of 3 years, giving your answer correct to the nearest dollar. [2]

[Ans: \$7218]

5 **2019/Y1RP/EOY/Q20**

During the annual membership recruitment drive, the price of a family pass for the Zoo was reduced from \$230 to \$212. If the family pass was sold at its original selling price, the Zoo would have made a profit of 25%.

(i) Calculate the percentage profit on the cost when it was sold at the reduced price. [3]

Mr. Ray decided to purchase the family pass for the Zoo during the annual membership recruitment drive. He also opted for an upgrade to visit the Wildlife Park by paying a one-time flat fee of $\$x$. The total amount was paid using Mr Ray's credit card which offers him 12 months of interest-free instalment at \$15 per month after paying a downpayment of \$100.

(ii) Find the value of x. [2]

[Ans: (i) $15\frac{5}{23}\%$ (ii) $x = 68$]

6 **2019/Y1RP/EOY/Q22**

(i) The scale of a map of a park is 4 cm to x km. The park has an area of 48 cm^2 on the map. Find, in terms of x, the actual area of the park. [2]

(ii) Upgrading works are carried out in a park. It takes 4 maintenance workers, working y hours a day to upgrade the park in 5 days. Given that all the maintenance workers work at the same rate, how many hours per day must 3 maintenance workers work if the park upgrading works is to be completed in 8 days? Give your answer in terms of y, in its simplest form. [3]

[Ans: (i) $3x^2$ km^2 (ii) $\frac{5y}{6}$ hours per day]

7 **2018/Y1RP/EOY/SectB/Q7**

A map is drawn to a scale of 1 cm to 4 km.
On this map, a reserve in the outskirts of the city has an area of 4.5 cm^2.

(a) Find, in km^2, the actual area of the reserve. [2]

(b) Find, in terms of n, the area of the reserve drawn on another map which has a scale of $1:300000\sqrt{n}$. [2]

[Ans: (a) 72 km^2 (b) $\frac{8}{n}$ cm^2]

8 **2018/Y1RP/EOY/SectB/Q8**

(a) A van uses 13.5 litres of fuel to travel a distance of 180 km. Giving your answer in litres per 100 km, calculate the fuel consumption of the van. [1]

(b) Frank's car has a petrol consumption of 6.2 litres per 100 km.

(i) Calculate the distance that he can travel on a full tank of 55 litres. [1]

(ii) Petrol costs \$2.34 per litre.
Calculate how much, correct to the nearest cent, the petrol will cost Frank for a journey of 320 km. [2]

[Ans: (a) 7.5 litres per 100 km (b)(i) $887\frac{3}{31}$ km (ii)\$46.43]

9 **2018/Y1RP/EOY/SectB/Q12**

(a) The bulk orders of the number of packet of handmade noodles from various customers **per week** for RafflesMee Supplier is shown in the following frequency table.

Number of packet of handmade noodles, x	10	20	30	40	50
Number of bulk orders	9	20	18	p	12

(i) If the median is 30, find the largest possible value of p. [1]

(ii) If the mode of the distribution is 20, find the maximum number of bulk orders the supplier has per week. [1]

(iii) The mean number of packet of handmade noodles order is 35. Find the value of p. [2]

(b) The selling price of each packet of handmade noodles is \$1.10. The table below shows the discount on the selling price of the noodles for the respective number of handmade noodles ordered.

Number of packets of handmade noodles, x	**Discount for bulk orders**
$x < 20$	No discount
$20 \le x < 50$	Discount: 5% off selling price
$x \ge 50$	Discount: 7% off selling price

(i) Using the value of p from **(a)(iii)**, show that the total income received by RafflesMee Supplier from the sale of the noodles in 1 year (52 weeks), is \$277 248.40. [3]

(ii) RafflesMee Supplier decides to deposit his total income received in the year in a bank for a period of 5 years. There are two banks which offer the following interest rates.

Sheares Bank	Marshall Bank
k % per annum simple interest	1.25% per annum compound interest, compounded half-yearly

Find the value of k, to 3 significant figures, for which RafflesMee Supplier would earn the same amount of interest from both banks. [4]

[Ans: (a)(i) $p = 34$ (ii) 78 (iii) 87 (b)(ii) 1.29]

10 **2017/Y1RP/EOY/SectA/Q5***

Given that the square of y is inversely proportional to $(x+3)$ and $y=3$ when $x=1$.

Show that $y=\frac{c}{\sqrt{x+3}}$, where c is a non-zero constant, and hence state the possible values of c. [2]

(a) For a particular value of y, the value of $(x+3)$ is p. Find an expression for x, in terms of p, when a particular value of y is doubled. [3]

(b) Explain whether x can take the value of -3 in this relation. [1]

[Ans: $c=\pm 6$ (a) $x=\frac{p}{4}-3$ or $x=\frac{p-12}{4}$ (b) $x\neq -3$]

11 **2017/Y1RP/EOY/SectB/Q2**

An area of x cm^2 on map A has an actual area of 6.25 km^2.

(a) Write down the area of a region on the map which represents an actual area of 50 km^2. Leave your answer in terms of x and in cm^2. [1]

(b) Given that $x = 4$, calculate

(i) the actual distance, in km, of a path P that is 6 cm on the map A, [2]

(ii) the distance of the path P, in cm, drawn on another map B which has a scale of 1 : 200000. [1]

[Ans: (a) 8x cm^2 (b)(i) 7.5 km (ii) 3.75 cm]

12 **2017/Y1RP/EOY/SectB/Q10**

At the annual motorshow, Mike and Nelvin each wants to buy a car that costs \$104500. Each of them plans to make an initial downpayment of x% of the car price. The balance is to be paid by obtaining a loan from either Amber Bank or Bronze Bank.

(a) Amber Bank charges 2.1% simple interest per annum for a period of 7 years. Mike decides to take up the financing plan offered by Amber Bank and he has to make a monthly payment of \$990. Show that $x = 30.6$ when corrected to 1 decimal place. [3]

(b) Bronze Bank charges an interest rate of 2.3% per annum **compounded half yearly** over a period of 5 years. Nelvin decides to take up the financing plan offered by Bronze Bank. Find the total loan amount he took up for the car, correct to the nearest thousand dollars. [4]

(c) Which bank makes a better loan offer? Justify your answer clearly. [1]

[Ans: (b) \$81000 (c) Bronze Bank]

13 **2016/Y1RP/EOY/SectA/Q5***

Given that the cube of y is inversely proportional to x and $y = 3$ when $x = 8$.

(a) Express y in terms of x. [2]

(b) Find the percentage change in y if x decreases by 48.8%. [2]

[Ans: (a) $y=\frac{6}{\sqrt[3]{x}}$ (b) 25%]

14 **2016/Y1RP/EOY/SectB/Q5**

A map is drawn to the scale of $1 : x$.

(a) On the map, a hiking trail with a distance of 4.85 km is represented by a length of 19.4 cm. Find the value of x. [2]

(b) The actual area of a reservoir is 2.4 km^2. Calculate the area, in cm^2, on the map which represents the reservoir. [2]

[Ans: (a) $x = 25000$ (b) 38.4 cm^2]

15 **2015/Y1RP/EOY/SectB/Q8**

It is given that q is directly proportional to p^2. If the difference in the values of q when $p = 7$ and when $p = 5$ is 432, express q in terms of p. [3]

[Ans: $q = 18p^2$]

16 **2016/Y1RP/EOY/SectB/Q14**

(a) Ethan took a renovation loan from a bank that charges him 2.5% simple interest per annum. If Ethan pays a monthly instalment of \$653.31, he would be able to repay the loan fully at the end of 4 years. Find the amount of renovation loan Ethan has taken from the bank. Leave your answer correct to the nearest dollar. [3]

(b) Gerald deposited his savings of \$25500 into Bank A which offered an interest rate of 0.5% per annum **compounded quarterly** for a period of 3 years. The bank imposed a penalty of 25% on the interest accumulated if any withdrawal is made before the end of 3 years. If Gerald withdrew all of his savings at the end of 2.5 years, calculate the total interest he would get. Leave your answer correct to the nearest dollar. [4]

[Ans: (a) \$28508 (b) \$240]

17 **2015/Y1RP/EOY/SectB/Q9**

The actual area of a park is 225 km^2. It is represented by an area of 36 cm^2 on Map A.

(a) Express the scale of Map A in the form $1 : n$. [2]

(b) What is the area of the park on Map B whose scale is 1 : 500 000? [2]

[Ans: (a) 1 : 250000 (b) 9 cm^2]

18 **2015/Y1RP/EOY/SectB/Q10**

Ben wished to purchase a vacuum cleaner for his home. He came across the following two advertisements.

Shop *A*
Original Price
\$139.90

Sale!
10% discount

For customers who pay using *XYZ* credit cards, they enjoy an additional 10% discount off the discounted price.

Shop *B*
Original Price
\$129.90

Sale!
15% discount

Ben decided to use *XYZ* credit card to pay for the vacuum cleaner in either shop. Where should he purchase the vacuum cleaner to enjoy the best discount? Explain your answer clearly. [4]

[Ans: Shop A]

19 **2015/Y1RP/EOY/SectB/Q11**

Alex wishes to deposit \$50 000 into a bank for 20 years. He found the following schemes from Bank A and Bank B.

Bank A offers a saving account which pays a simple interest rate of 3% per annum.

Bank *B* offers a saving account which pays an interest rate of 2.5% per annum compounded monthly.

Which bank should Alex choose to maximize his savings? Justify your answer clearly. [5]

[Ans: Bank B]

20 **2014/Y1RP/EOY/SectB/Q2**

Paul intends to buy a Macbook Pro selling at \$1688 using a hire purchase scheme. The scheme comprises a down payment of 25% and monthly instalments over 24 months. If the interest is charged at 3% per annum, calculate the monthly instalment Paul has to pay, leaving your answer correct to 2 decimal places. [3]

[Ans: \$55.92]

21 **2014/Y1RP/EOY/SectB/Q8**

A map uses 4 cm^2 to represent an actual area of 9 m^2. Calculate

(a) the actual area of a plot of land, in m^2, which is 50 cm^2 on the map, [1]

(b) the distance on the map, in cm, of 2 points which are 0.06 km apart. [3]

[Ans: (a) 112.5 m^2 (b) 40 cm]

22 **2014/Y1RP/EOY/SectB/Q9**

Breadwhisper sells 700 flame-floss buns per day at \$1.80 each. Due to an increase in the cost of flour, the price of each flame-floss bun increased in the ratio 5 : 4. As a result, the total amount received from selling 700 flame-floss buns sold previously dropped by 35%. Find the number of flame-floss buns sold at the new price. [4]

[Ans: 364]

23 **2014/Y1RP/EOY/SectB/Q11**

To raise funds for the students under the Financial Assistant Scheme (FAS), Gryphon's Lair will mark up the prices of its items to make a 25% profit but allow a 5% discount if the total bill before discount is at least \$15. Mr. Raffles Degenerous paid a total of \$72 for all the items he purchased from Gryphon's Lair after the discount. The difference between the marked up price (before discount) and the cost price for this particular sale will be donated to FAS. Find, to the nearest cent,

(a) the selling price before discount, [2]

(b) the amount donated to FAS by Gryphon's Lair for this particular sale. [2]

[Ans: (a) \$75.79 (b) \$15.16]

24 **2013/Y1RP/EOY/SectB/Q6**

A shop marked up its prices to make a 30% profit on cost but allows a 5% discount if a customer uses their membership card on any of their purchases. Benjamin paid \$247 for a jacket using his membership card.

(a) If the price of the jacket paid for by Benjamin includes a 7% Goods and Services Tax (GST), find the GST amount correct to the nearest cents. [1]

(b) Find the percentage profit made by the shop on this particular sale. [3]

[Ans: (a) \$16.16 (b) 23.5%]

25 **2013/Y1RP/EOY/SectB/Q9**

A map *X* is drawn to a scale of 1 : 175 000. Two points are 4 cm apart on the map and a region *R* has an area of 4 cm^2 on Map *X*. Calculate

(a) the actual distance, in km, of the two points, [1]

(b) the actual area, in km^2, of region *R*, [2]

(c) the representative fraction (R.F.) of another Map *Y*, given that the area of region *R* on Map *Y* is 49 cm^2. [3]

[Ans: (a) 7 km (b) 12.25 km^2 (c) $\frac{1}{50000}$]

26 **2013/Y1RP/EOY/SectB/Q11**

Mr Rishi intends to buy a private property valued at 1.44 million. He is considering taking up a **full** loan with a local bank of a 30 years repayment period.

(a) *JAE* bank offers the following interest rates:

First 6 years	4% simple interest per annum
Year 7 onwards	2.5% interest per annum, compounded every 3 months

Calculate the amount of money, correct to the nearest cent, Mr Rishi would need to pay the bank each month. [3]

(b) *BOM* bank offers a flat interest rate of 5.5% per annum for the entire period of repayment. If Mr Rishi is able to afford a monthly payment of **at most** \$11 650, **form an inequality** and **hence** find the minimum financing period, in years, for him. [3]

[Ans: (a) \$9020.85 (b) 24 years]

27 **2012/Y1RP/EOY/SectB/Q5**

Mdm Lee bought a bracelet from the department store and sold it to Mrs Teo, making a profit of 20%. Mrs Teo in turn sold it to her niece, Lili, at a discount of 35%. If Lili paid \$97.50, how much did Mdm Lee pay for the bracelet? [2]

[Ans: \$125]

28 **2012/Y1RP/EOY/SectB/Q9**

(a) Map P uses a scale of 1 : 20 000 and Map Q uses 2 cm to represent an actual distance of 1 km. Given that a cycling path measures 6.8 cm on Map P, find the length of the cycling path on Map Q. [3]

(b) On Map X, an area of 48 cm^2 represents an actual area of 27 km^2. If the Map X has a scale of 1 : x, find the value of x. [2]

[Ans: (a) 2.72 cm (b) $x = 75000$]

29 **2012/Y1RP/EOY/SectB/Q12**

(a) Mrs Tan deposited a sum of money in a savings account at HL&T Bank that pays 3.5% per annum simple interest. After 3 years, her money is worth a total of S\$21 639.20. Calculate the amount of money she deposited, giving your answer to the nearest dollar. [3]

(b) Mrs Tan then invested S\$20 000 in a fixed deposit account from the \$21 639.20 she has and converted the remaining of the money into Japanese yen for her overseas vacation. Calculate

(i) the total amount she has in the fixed deposit account at the end of 2 years if the fixed deposit account pays 4% per annum compound interest, compounded every half year, giving your answer to the nearest cent, [2]

(ii) the amount of Japanese yen she will receive if the exchange rate is 1000 yen = S\$ 15.45, giving your answer to the nearest yen. [2]

[Ans: (a) \$19583 (b)(i) \$21648.64 (ii) 106097 Yen]

30 **2011/Y1RP/EOY/SectB/Q9**

The actual area of a pond is 5.76 km^2.

(a) This pond is represented by an area of 16 cm^2 on map X. Find the linear scale of Map X in the form 1 : r. [2]

(b) The side of a square field is represented by a length of 2 cm on Map X. This square field is also represented by an area of 0.64 cm^2 on another Map Y. Find the actual length, in km, of a road which is represented by 0.5 cm on Map Y.[3]

[Ans: (a) 1 : 60000; (b) 0.75 km]

31 **2011/Y1RP/EOY/SectB/Q13**

In the year 2009, Mrs Shanti earned 12% more than what she earned in 2008. In 2010, she earned 18% more than what she earned in 2009. Calculate the total percentage increase in her earnings from 2008 to 2010. [2]

[Ans: 32.16%]

32 **2011/Y1RP/EOY/SectB/Q14**

Mr. Kim invested $85000 in an investment account which pays 2.2% per annum compound interest, compounded quarterly. Find the total amount in his investment account after 2 years, giving your answer to the nearest cent. [3]

[Ans: $88812.79]

33 **2011/Y1RP/EOY/SectB/Q15**

An Australian news reporter who travelled from Thailand to New York exchanged 150000 Thai Baht (THB) to US Dollar at the rate of US$1 = 30.79 THB.

(a) Find the amount of US Dollar that the Australian news reporter received, giving your answer to the nearest cent. [2]

(b) During the trip, he saved 60% of the amount and spent the remainder. He was reimbursed in Australian Dollars (AU$) for 15% of his expenditure at the rate of US$1 = AU$0.93. Calculate the amount of Australian Dollars which he received, giving your answer to the nearest cent. [2]

[Ans: (a) US$4871.71; (b) AU$271.84]

34 **2010/Y1RP/EOY/SectB/Q1**

A map is drawn on a scale of 1 : 20000.

(a) The actual length of a road is 12 km. Find the length, in cm, of the line on the map which represents this road. [2]

(b) On the map, the area representing a district is 0.5 m^2. Calculate the actual area of the district, giving your answer in km^2. [2]

[Ans: (a) 60 cm (b) 200 km^2]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 10: PYTHAGORAS' THEOREM

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

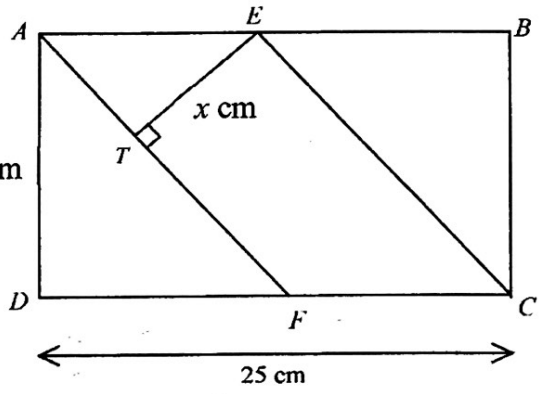
1 **2018/Y1RP/EOY/SectB/Q9**

In the diagram (not drawn to scale), $ABCD$ is a rectangle, with length 25 cm and breadth 9 cm. E and F are points on AB and DC such that $AE = FC$. T is a point on AF such that ET is perpendicular to AF and $ET = x$ cm. Given that the area of triangle ADF and quadrilateral $AECF$ are the same, find

(a) the length of DF, [3]

(b) the value of x. [3]

[Ans: (a) $16\frac{2}{3}$ cm (b) 3.96]



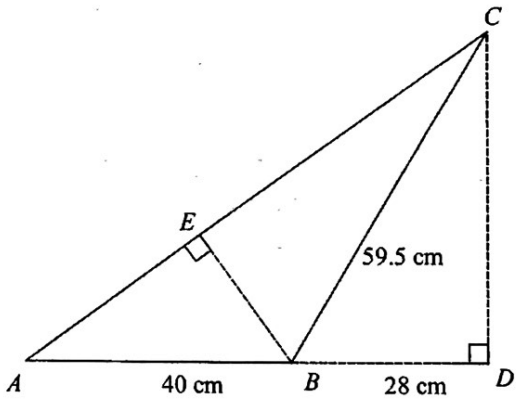
2 **2017/Y1RP/EOY/SectB/Q3**

The diagram (not drawn to scale) shows a triangle ABC with $AB = 40$ cm, $BC = 59.5$ cm and $BD = 28$ cm. E lies on AC such that angle AEB = angle $ADC = 90°$.

(a) Find the area of triangle ABC. [2]

(b) Hence, find the length of BE. [2]

[Ans: 1050 cm^2 (b) 24.4 cm]



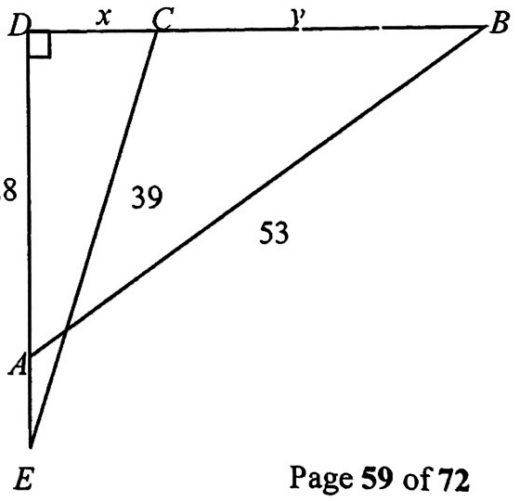
3 **2016/Y1RP/EOY/SectB/Q7**

ΔABD and ΔCDE are right-angled triangles. A and C lie on DE and BD respectively. Given $AD = 28$ cm, $CE = 39$ cm, $AB = 53$ cm, $BC = y$ cm and $CD = x$ cm.

(a) Show that $x + y = 45$. [1]

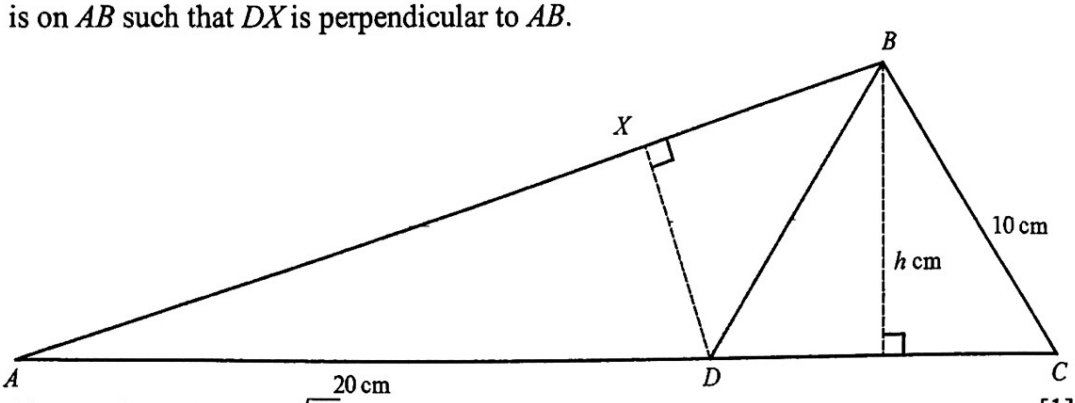
(b) Hence find the value of y if $CE = 39$ cm and $\frac{CD}{DE} = \frac{5}{12}$. [3]

[Ans: (b) y = 30]



4 **2015/Y1RP/EOY/SectB/Q14**

The diagram shows two triangles, ABD and BCD. ΔBCD is an equilateral triangle with sides 10 cm and height, h cm, and $AD = 20$ cm. ADC is a straight line, and the point X is on AB such that DX is perpendicular to AB.



(a) Show that $h = \sqrt{75}$. [1]

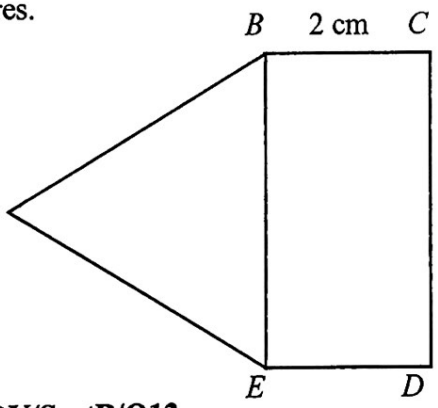
(b) Find the length of DX, leaving your answer correct to 2 decimal places. [3]

[Ans: (b) 6.55 cm]

5 **2014/Y1RP/EOY/SectB/Q3**

The diagram on the right shows a rectangle $BCDE$ and an isosceles triangle ABE, where $AB = AE$. Given that $BC = 2$ cm, $BE = 2BC$ and the area of rectangle $BCDE$ is equal to the area of triangle ABE, find the length of AE, giving your answer correct to 3 significant figures. [3]

[Ans: 4.47 cm]



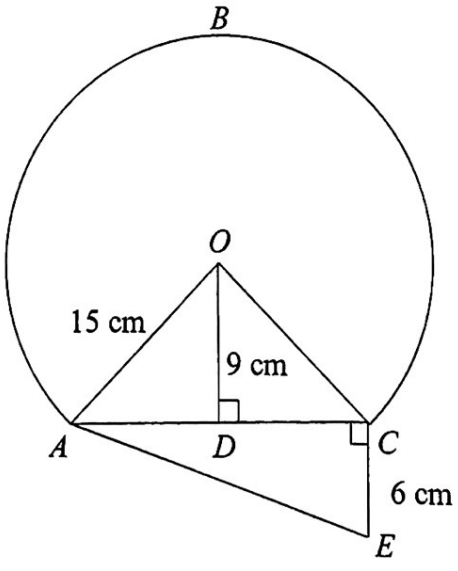
6 **2013/Y1RP/EOY/SectB/Q12**

In the figure below, point O is the centre of a circle with the major arc ABC. ADC is a straight line and $\angle ODC = \angle DCE = 90°$. It is also given that $OA = 15$ cm, $OD = 9$ cm, $CE = 6$ cm and $AE = (3x+1)$ cm.

(a) Explain why ΔAOC is an isosceles triangle. [1]

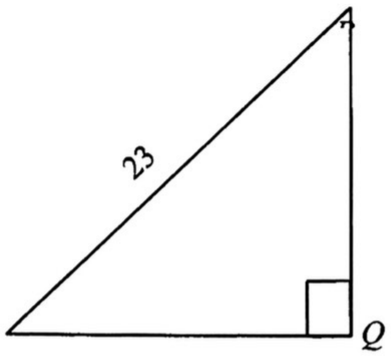
(b) Calculate, to 2 decimal places, the value of x. [3]

[Ans: (b) x = 7.91]



7 **2012/Y1RP/EOY/SectB/Q4**

PQR is an isosceles right-angled triangle where $PR = 23$ cm. Find the area of triangle PQR. [3]

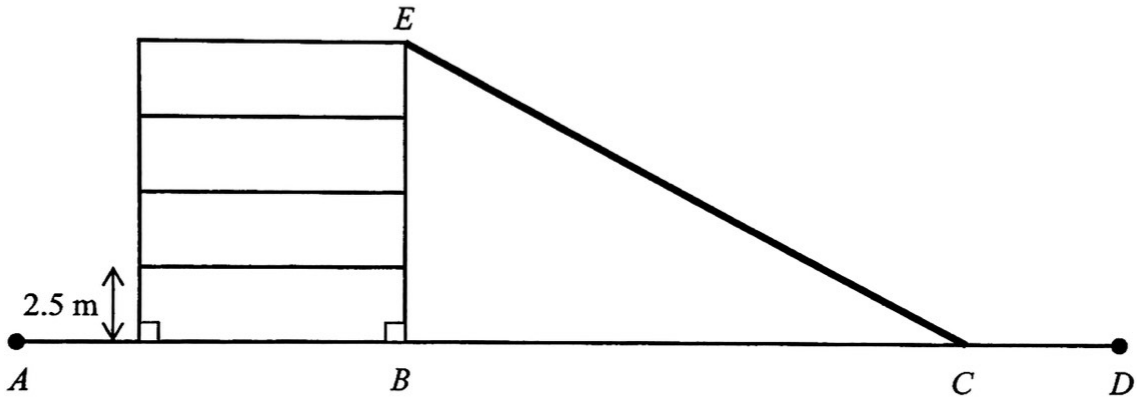


[Ans: 132.25 cm²]

8 **2011/Y1RP/EOY/SectB/Q3**

Four identical floating platforms used for the National Day Parade, each of height 2.5 m, are stacked on top of one another on a flat surface AD.

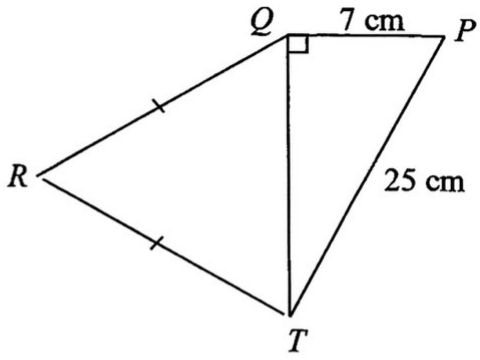
A ramp, EC, of length 26 m is constructed from C to the top of the floating platform as shown. Calculate the distance BC. [3]



[Ans: 24 m]

9 **2010/Y1RP/EOY/SectB/Q11**

An isosceles triangle QRT and a right angled triangle PQT are placed as shown in the diagram. Given that area of $\Delta QRT = 192$ cm^2, $\angle PQT = 90°$, $PQ = 7$ cm, $PT = 25$ cm and $RQ = RT$, find the length QR. [4]



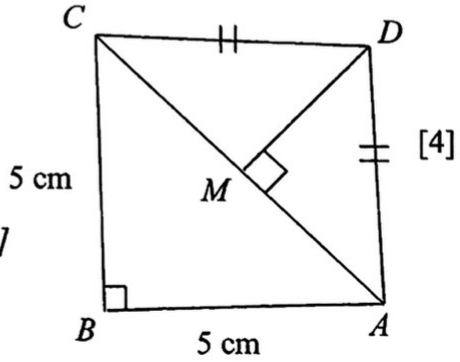
[Ans: 20 cm]

10 **2009/Y1RP/EOY/SectB/Q14**

In the diagram below, $AB = BC = 5$ cm, $AD = CD$, $\angle ABC = 90°$ and area of triangle $CAD = 15$ cm^2. M is the foot of perpendicular line from point D to the midpoint of length AC.

(a) Show that $DM = \dfrac{30}{\sqrt{50}}$ cm;

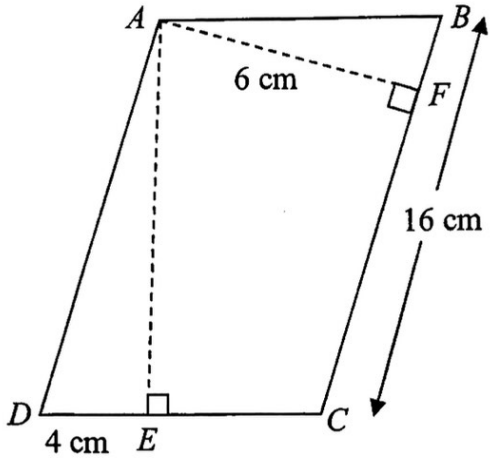
(b) **hence** find the length CD. [4]



[Ans: (a) $AC = \sqrt{50}$; $\frac{1}{2}\left(\sqrt{50}\right)(DM) = 15$ (b) 5.52 cm]

11 **2008/Y1RP/EOY/SectB/Q11**

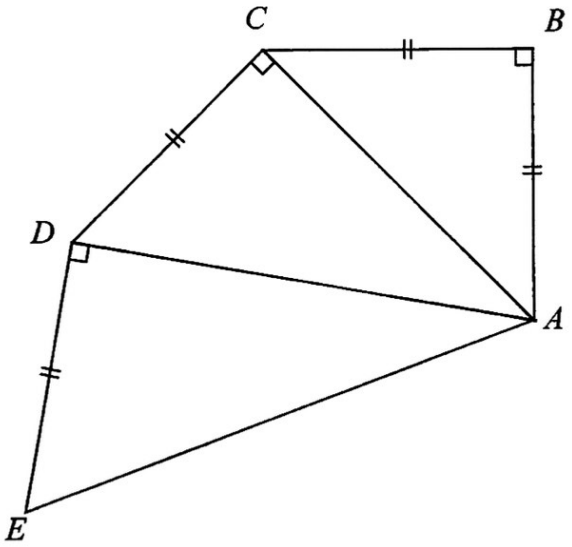
In the parallelogram $ABCD$, AF is perpendicular to BC and AE is perpendicular to DC. Given that $AF = 6$ cm, $BC = 16$ cm and $DE = 4$ cm, calculate the length of EC. [3]



[Ans: 2.20 cm]

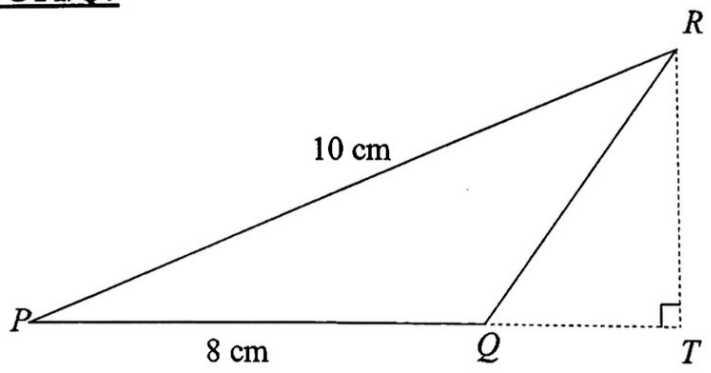
12 **2007/Y1RP/EOY/SectB/Q14**

Find the length of AE given that $AB = BC = CD = DE = 3$ cm. [2]



[Ans: 6 cm]

13 **2005/Y2RP/CT1/Q7**



In the diagram, PQR is a triangle with sides $PQ = 8$ cm and $PR = 10$ cm. The area of triangle PQR is 20 cm^2 and T is the foot of the perpendicular from R to PQ produced.

(i) Calculate the length RT. [2]

(ii) Calculate the length QT. [2]

[Ans: (i) 5 cm (ii) 0.660 cm]

RAFFLES INSTITUTION
MATHEMATICS DEPARTMENT
2023 YEAR 1 RP MATHEMATICS
TOPIC 11: MENSURATION

REVISION WORKSHEET

Name: Class: Sec 1 ( ) Date:

1 **2020/Y1RP/EOY/Q20**

Figure 4a shows a wire frame in the shape of a sector OAB with centre O and radius x cm. Angle $AOB = 75°$ and the area of the sector OAB is $94\frac{2}{7}$ cm^2. [Take $\pi = \frac{22}{7}$]

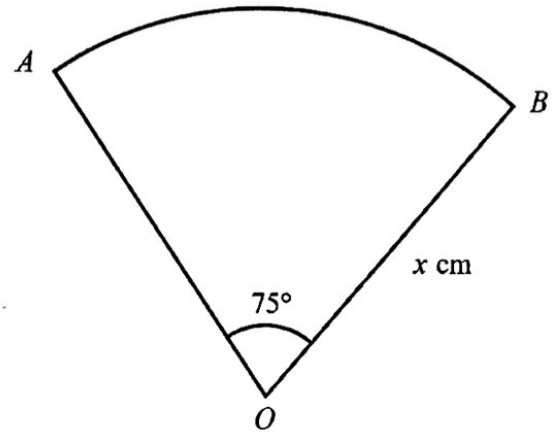


Figure 4a

(i) Find the value of x. [2]

(ii) Find the perimeter of sector OAB, leaving your answer as a fraction. [2]

(iii) The wire frame is then reshaped to form an isosceles trapezium, $PQRS$, as shown in **Figure 4b.** It is given that $PS = QR = 4$ cm, PQ is parallel to SR and the length of PQ is equal to the radius of the sector in **Figure 4a**.

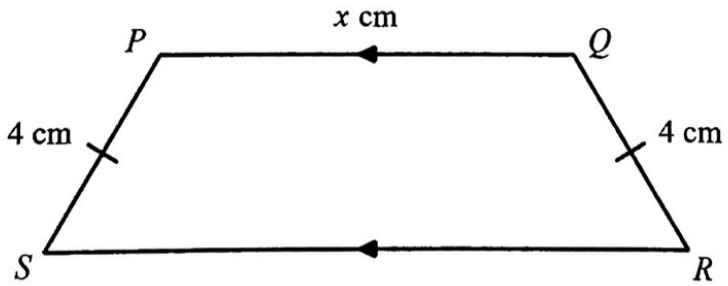


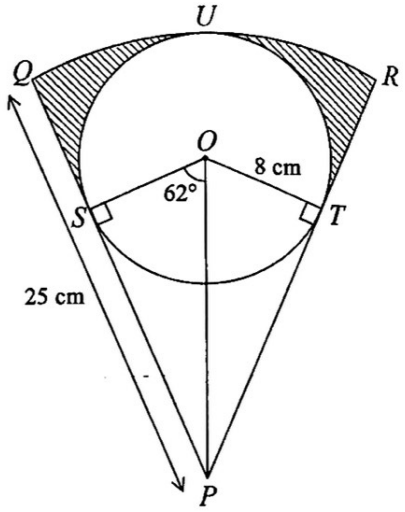
Figure 4b

Show that the shortest distance between PQ and SR is 1.059 cm, correct to 4 significant figures. [2]

(iv) **Hence,** find the area of trapezium $PQRS$. [1]

[Ans: (i) $x = 12$ (ii) $39\frac{5}{7}$ cm (iv) 16.8 cm^2]

2 **2019/Y1RP/EOY/Q24**



The diagram shows a sector $PQUR$ with centre P and radius 25 cm.
A circle with centre O and radius 8 cm is inscribed inside the sector. The circle touches the sector at points S, T and U such that angle PTO = angle $PSO = 90°$.

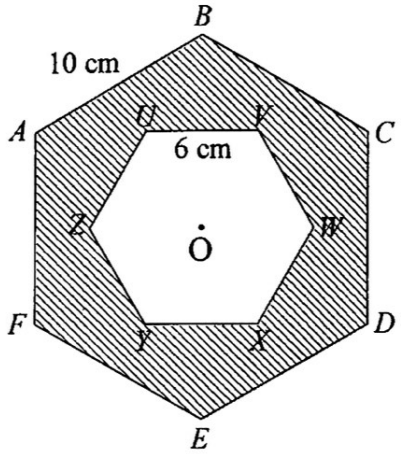
(i) Show that $PS = 15$ cm. [1]

Given that angle $POS = 62°$ (corrected to nearest degree) and using $PS = 15$ cm,

(ii) find the area of the shaded region. [3]

[Ans: (ii) 53.7 cm²]

3 **2019/Y1RP/EOY/Q25**



The diagram shows a larger regular hexagon $ABCDEF$ with sides 10 cm containing a smaller regular hexagon $UVWXYZ$ with sides 6 cm. Both hexagons share the same centre O.

(i) Explain why triangle OAB is equilateral. [1]

(ii) Find the area of the triangle AOB. [3]

(iii) Hence, find the area of the shaded region. [3]

[Ans: (ii) 43.3 cm² (iii) 166 cm²]

4 **2018/Y1RP/EOY/SectB/Q10**

Diagram I shows a coin which can be modelled by the shape shown in Diagram II. $ABCDEFGH$ is a regular octagon with $AB = 1.2$ cm and angle $AHC = 45°$.

Diagram I

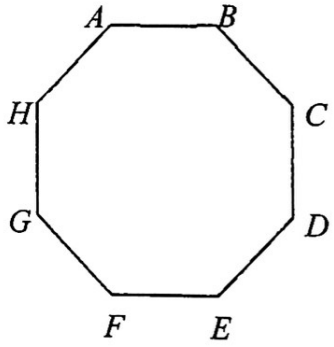


Diagram II

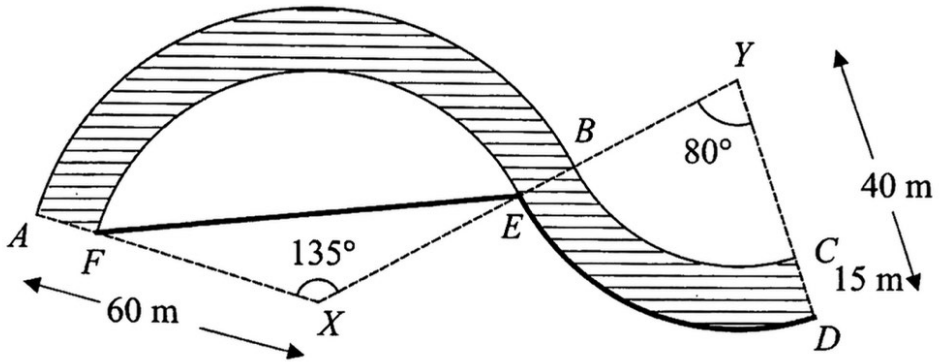
(a) By considering the trapezium $ABCH$, calculate the length HC. [3]

(b) Calculate the area of the coin. [3]

[Ans: (a) 2.90 cm (b) 6.95 cm²]

5 **2018/Y1RP/EOY/SectB/Q11**

The shaded region in the diagram, not drawn to scale, shows a section of a racing circuit. *ABEXF* is a sector of a circle of radius 60 m and *DEBYC* is a sector of a circle of radius 40 m. The track has a uniform width of 15 m.



(a) Given that the angle *AXE* is 135° and the angle *DYE* is 80°, calculate the area of the track. [3]

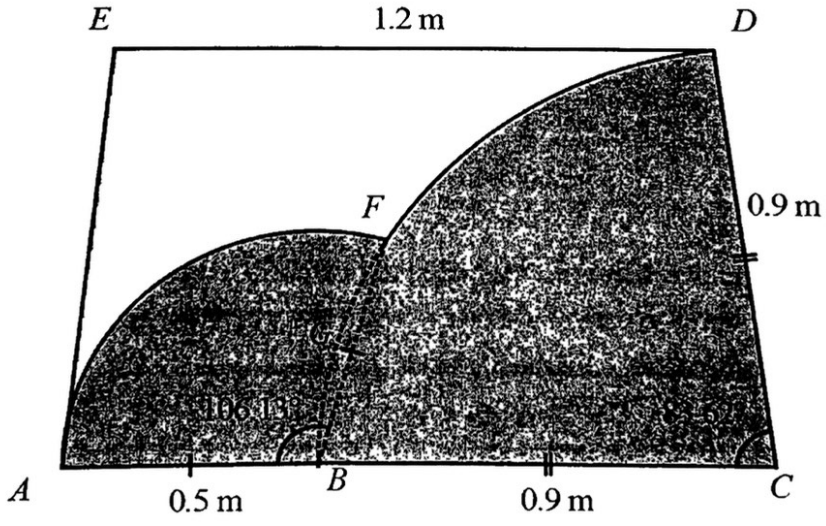
(b) A metal cordon consists of the chord *FE* and arc *ED* is erected to ensure the safety of spectators. Given that the shortest distance from *X* to *FE* is 17.2m, find the length of the metal cordon. [4]

[Ans: (a) 2540 m^2 (b) 139 m]

6 **2017/Y1RP/EOY/SectB/Q11**

[The value of π is 3.142 correct to three decimal places]

The diagram below shows a proposed model for a car's windscreen wipers. The windscreen is modelled by an isosceles trapezium *ACDE* of lengths *AC* = 1.4 m and *DE* = 1.2 m. The sector *BCDFG* shows the area covered by the longer wiper of length 0.9 m with centre *C* and angle *BCD* = 83.62° . The sector *ABF* shows the area covered by the shorter wiper of length 0.5 m with centre *B* and angle *ABF* = 106.13° .



(a) Find angle *DCF*. [2]

(b) Find the perimeter of the shaded region. [4]

(c) Show that the area of segment *BFG* = 0.0119 m^2 when corrected to 3 significant figures. [3]

[Ans: (a) 51.36° (b) 4.03 m]

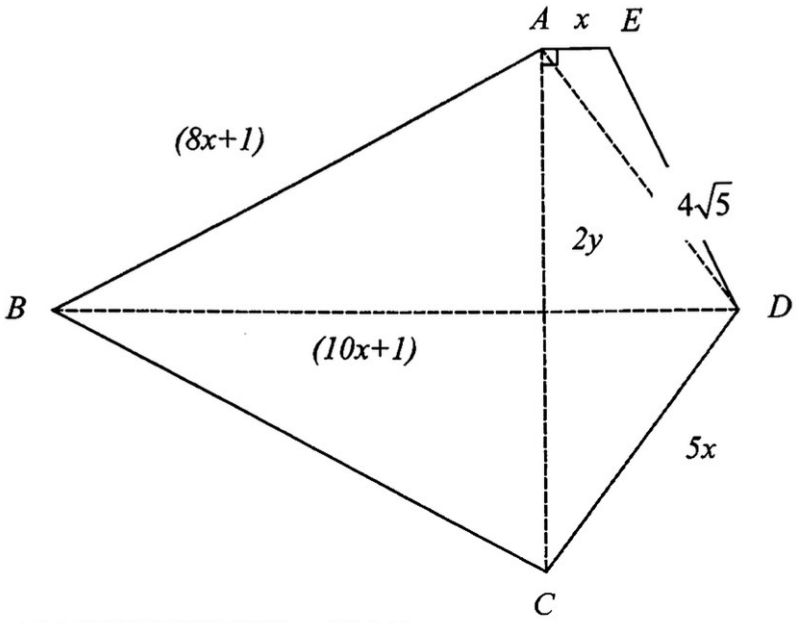
7 **2016/Y1RP/EOY/SectB/Q2**

The diagram below shows a park $ABCDE$ which consists of a triangle ADE and a kite $ABCD$. $AB = (8x+1)$ km, $AE = x$ km, $ED = 4\sqrt{5}$ km and $CD = 5x$ km. The diagonals AC and BD are $2y$ km and $(10x+1)$ km respectively.

(a) The perimeter of the park is $\left(46+4\sqrt{5}\right)$ km. Show that $x = 2$. [1]

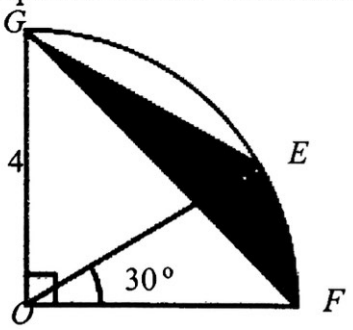
(b) Given that the area of the park is 176 km^2, find the value of y. [2]

[Ans: (b) y = 8]



8 **2016/Y1RP/EOY/SectB/Q13**

The diagram below shows a quadrant $OGEF$ with radius 4 cm and $\angle EOF = 30°$.



(Take $\pi = 3.142$)

(a) Find the perimeter of the shaded region EFG, correct to 2 decimal places. [3]

(b) Given that the area of $\Delta EOG = 6.928$ cm^2, find the area of the shaded region EFG, correct to 2 decimal places. [4]

[Ans: (a) 11.75 cm (b) 3.12 cm^2]

9 **2015/Y1RP/EOY/SectB/Q15**

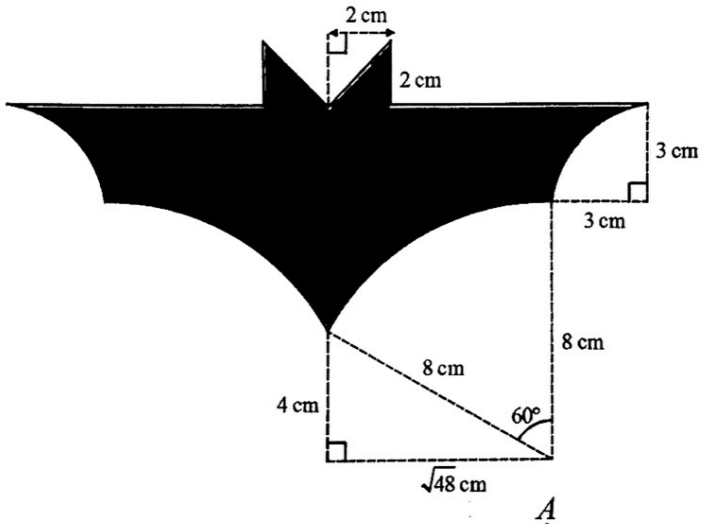
The shaded figure below shows a symmetric logo (not drawn to scale).

Find, giving your answers correct to 2 decimal places,

(a) tthe area of the logo, [3]

(b) tthe perimeter of the logo. [3]

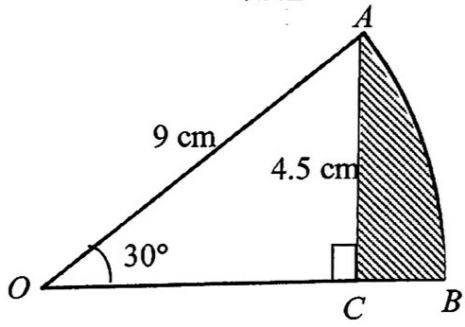
[Ans: (a) 65.55 cm^2 (b) 51.69 cm]



10 **2014/Y1RP/EOY/SectB/Q7**

In the figure, $OABC$ is a sector with radius OA = 9 cm and $\angle AOB = 30°$. ΔOAC is a right-angled triangle which lies inside the sector with $\angle OCA = 90°$ and AC = 4.5 cm. Find the area of the shaded region, leaving your answer correct to 3 significant figures. [4]

[Ans: 3.67 cm²]



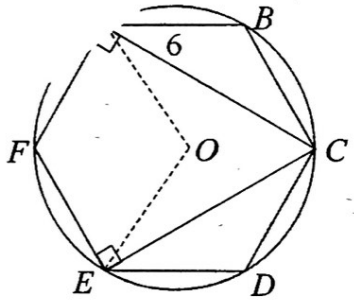
11 **2014/Y1RP/EOY/SectB/Q13**

The diagram below shows a regular hexagon $ABCDEF$ with length 6 cm inscribed in a circle with centre O. Given that $\angle FAC = \angle FEC = 90°$, by leaving your answers to 2 decimal places, find

(a) the area of the **kite** $ACEF$, [3]

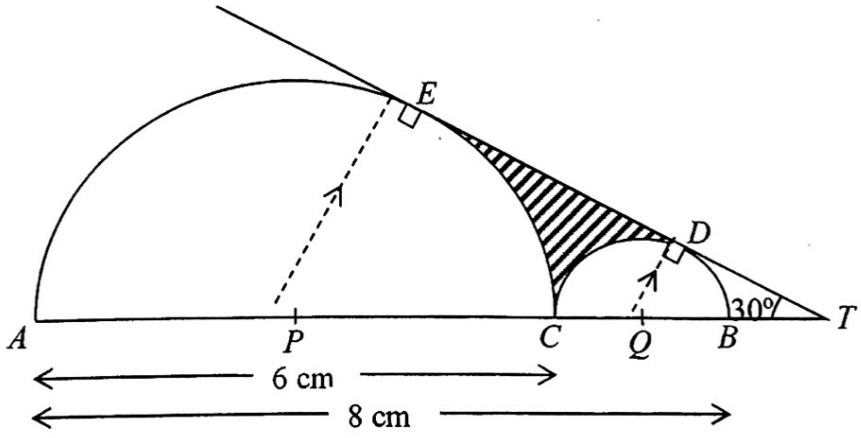
(b) the perimeter of **sector** $AOEF$. [2]

[Ans: (a) 62.35 cm² (b) 24.57 cm]



12 **2013/Y1RP/EOY/SectB/Q15**

The diagram shows two semicircles with centres P and Q.



The line EDT meets the semicircles at points E and D. The lines PE and QD are parallel to each other and perpendicular to the line EDT. It is also given that the points A, P, C, Q, B and T lie on the same straight line. AB = 8 cm, AC = 6 cm, $BT = QD$ and $\angle PTE = 30°$.

Calculate, to 3 significant figures,

(a) the perimeter of the shaded region, [4]

(b) the area of the shaded region. [3]

[Ans: (a) 8.70 cm (b) 1.17 cm²]

13 **2012/Y1RP/EOY/SectB/Q14**

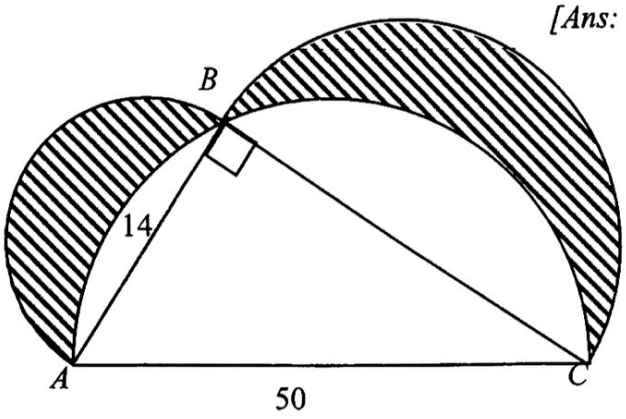
The figure below is formed by three overlapping semi-circles with diameters AB, BC and AC. Given that $AB = 14$ cm, $AC = 50$ cm and angle $ABC = 90°$, calculate

(a) the length of the diameter BC, [2]

(b) the perimeter of the shaded region, [3]

(c) the area of the shaded region. [3]

[Ans: (a) 48 cm (b) 176 cm (c) 336 cm²]



14 **2011/Y1RP/EOY/SectB/Q8**

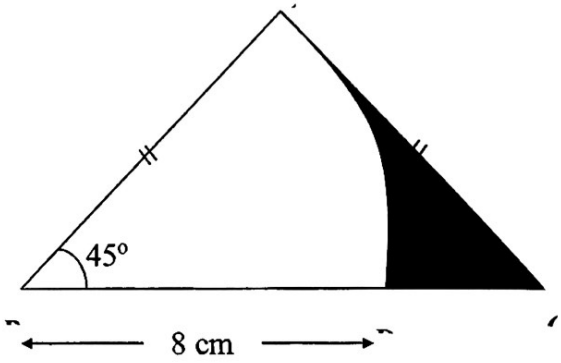
The figure shows an isosceles ΔABC and an arc AD with B as the centre. It is given that $AB = AC$, $BD = 8$ cm and $\angle ABC = 45°$.

Calculate, leaving your answer in terms of π,

(a) the length of arc AD, [2]

(b) the area of shaded region. [2]

[Ans: 2π cm ; (b) $32 - 8\pi$ cm^2]



15 **2010/Y1RP/EOY/SectB/Q12**

[Take $\pi = \frac{22}{7}$ in this question]

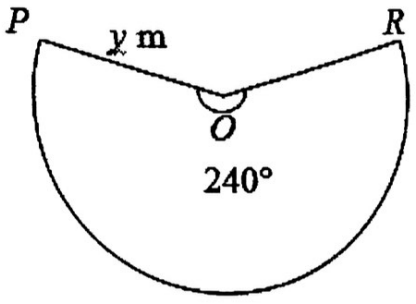
The diagram below shows a stadium in the shape of a **major sector** with centre O, radius y m and the area of the stadium is 924 m^2. Find

(a) the value of y,

(b) the perimeter of the stadium,

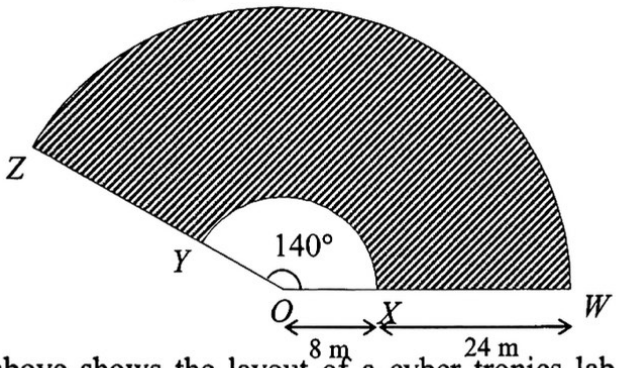
(c) the cost of fencing the stadium along the perimeter with each metre costing \$1.20. [5]

[Ans: (a) 21 (b) 130 m (c) \$156]



16 **2009/Y1RP/EOY/SectB/Q15**

[Take π to be 3.142 in this question]



The diagram above shows the layout of a cyber tronics lab and the shaded region represents the area needed for carpeting the floor. Calculate

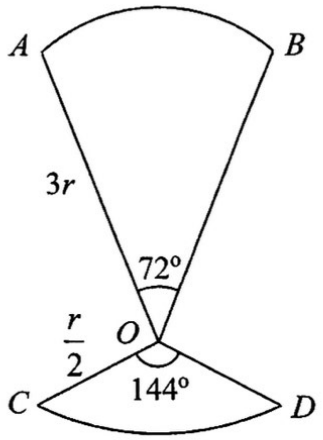
(a) the ratio of the arc length XY to the arc length of WZ, [1]

(b) the amount of money needed to carpet the floor if the carpeting costs \$2.50 per m^2, correct your answers to 2 decimal places. [3]

[Ans: (a) 1:4 (b) \$2932.54]

17 **2008/Y1RP/EOY/SectB/Q12**

The design of a school badge is made up of 2 sectors with centre O, as shown below. Given that $OA = 3r$, $OC = \frac{r}{2}$, $\angle AOB = 72°$ and $\angle COD = 144°$, express the area of the badge in terms of r and π. [3]



[Ans: $\frac{19}{10}\pi r^2$]

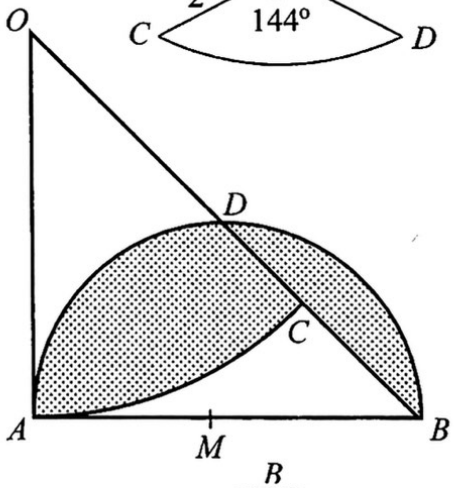
18 **2008/Y1RP/EOY/SectB/Q15**

In the figure, AC is an arc of a circle, centre O. BDA is a semi-circle with centre M. Given that $\angle OAB = 90°$ and $OA = BA = 14$ cm,

(a) find the length of arc AC,

(b) find the perimeter of the shaded region $ADBCA$.

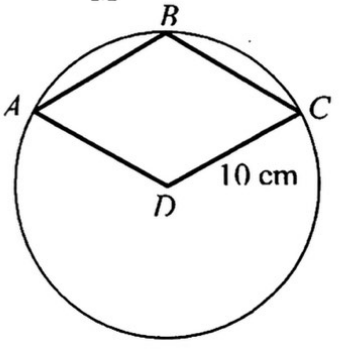
[Take $\pi = \frac{22}{7}$] [5]



[Ans: (a) 11 cm (b) 38.8 cm]

19 **2007/Y1RP/EOY/SectB/Q15**

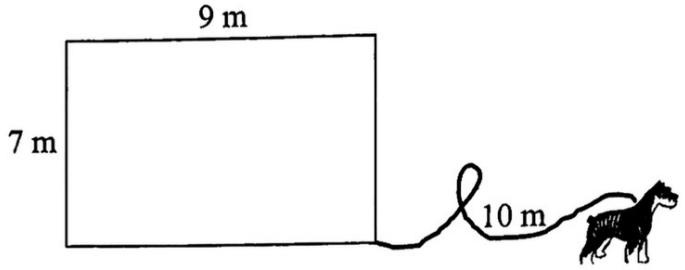
A rhombus $ABCD$ is formed by two radii and two chords of a circle with radius 10 cm. Find the area of the rhombus $ABCD$. [3]



[Ans: 86.6 cm^2]

20 **2007/Y1RP/EOY/SectB/Q16**

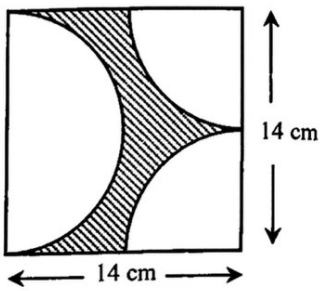
Skipper's doghouse has a rectangular base that measures 9 m long and 7 m wide. Skipper is tethered to a vertex with a 10 m leash. What is the maximum area of the region outside the doghouse that Skipper can reach? (Take $\pi = 3.142$) [4]



[Ans: 243.505 m^2]

21 **2006/Y1RP/CT2/Q4**

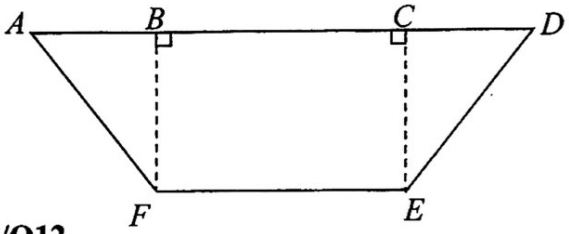
The figure shows a square of side 14 cm. Calculate the area and the perimeter of the shaded region. (Take $\pi = \frac{22}{7}$) [4]



[Ans: 42 cm^2; 58 cm]

22 **2006/Y1RP/CT2/Q9**

The figure below shows a trapezium $ADEF$ where $AF = DE$. Given that $AB : BC = 1:3$, AD = 15 cm and the area of trapezium $ADEF$ is 84 cm^2, find the length of AF correct to 3 significant figures. [5]

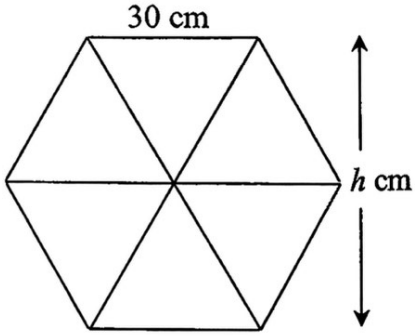


[Ans: 7.62 cm]

23 **2006/Y1RP/CT2/Q12**

An interior designer has decided to use regular hexagonal tiles of side 30 cm for a floor in a square room 2 m by 2 m.

(a) Find the height, h cm, of each tile.
(b) Justify how 12 tiles can fit onto the floor area by showing your calculations clearly.
(c) Calculate the area of the floor not covered by the tiles. [6]



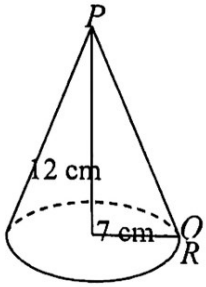
[Ans: (a) $30\sqrt{3}$ or 52.0 cm (b) 195 cm by $105\sqrt{3}$ or 182 cm (c) 11 900 cm^2]

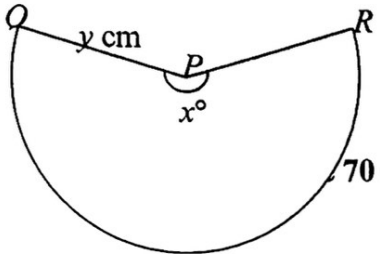
24 **2006/Y2RP/CT2/Q6**

Take $\pi = \frac{22}{7}$. A cone of base radius 7 cm and height 12 cm is cut along the side PQ and opened flat to form sector PQR as shown. This sector has angle $x°$ and radius y cm. Calculate, correct to 1 decimal place where necessary,

(a) the value of y, [1]
(b) the length of arc QR, [1]
(c) the value of x. [2]

[Ans: (a) 13.9 (b) 44 cm (c) 181.4]





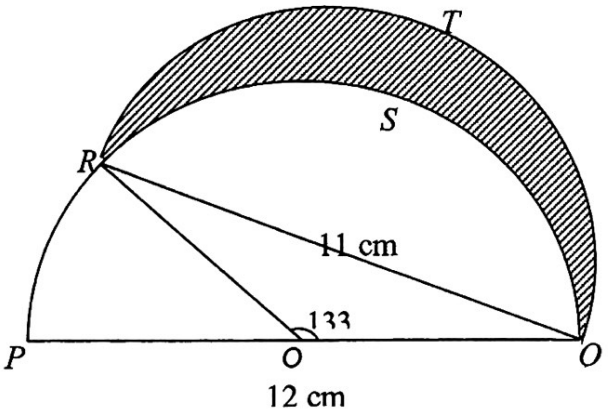
25 **2003/S2MA/EOY/P2/Q9**

Take $\pi = 3.142$. The figure shows a semicircle with centre O, diameter $PQ = 12$ cm and chord $QR = 11$ cm. A second semicircle with diameter QR is drawn. Given that $\angle ROQ = 133°$, find

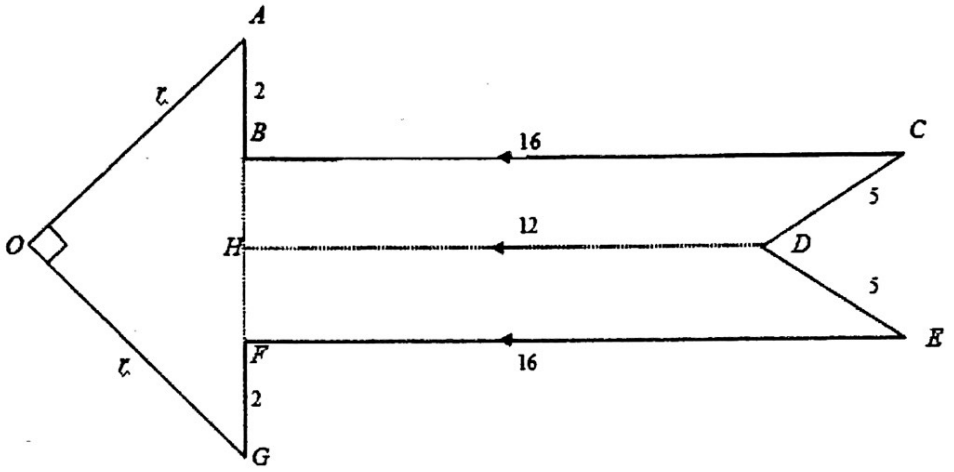
(a) the perimeter of the shaded region, [3]

(b) the area of the shaded region. [4]

[Ans: (a) 31.2 cm (b) 18.9 cm^2]



26 **2003/S1MA/EOY/P2/Q11**



The figure $ABCDEFGO$ is an arrow. BC, HD and FE are parallel. $\angle AOG = 90°$, $AB = FG = 2$ cm, $BC = FE = 16$ cm, $CD = DE = 5$ cm and $HD = 12$ cm. Find

(i) the value of r,

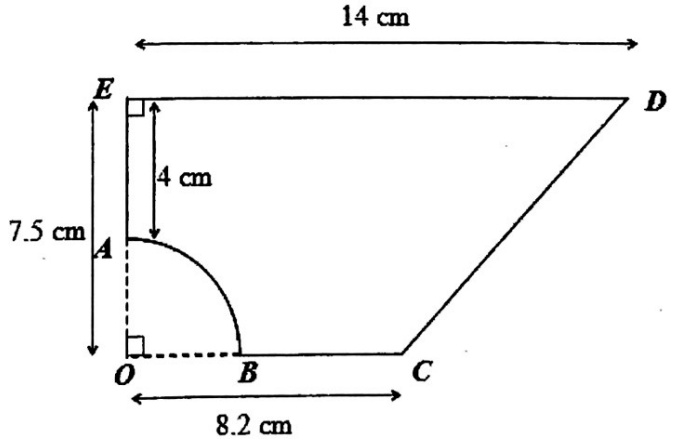
(ii) the perimeter of the figure $ABCDEFGO$. [5]

[Ans: (i) 7.07 (ii) 60.1 cm]

27 **2002/S1MA/EOY/P2/Q2**

Take $\pi = 3.142$.

Given that $OA = OB$ and $\angle AOB = \angle AED = 90°$, find the perimeter of the figure $ABCDE$. [5]



[Ans: 37.7 cm]

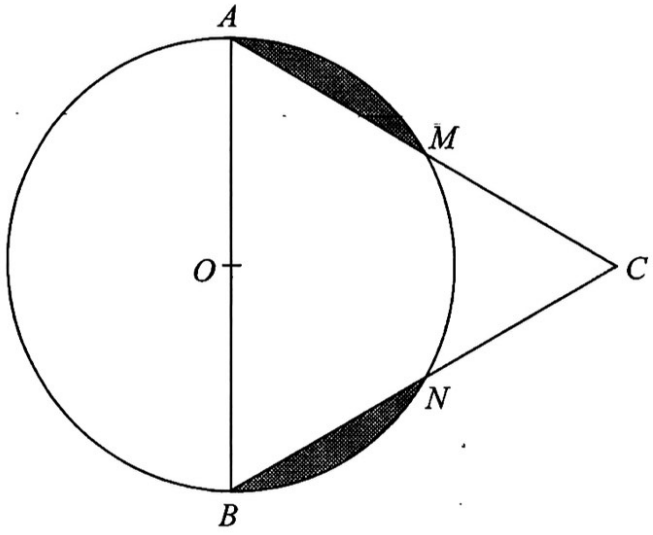
28 **2002/S2MA/EOY/P2/Q7**

Take π to be 3.142.

In the figure, the circle with centre at O has a diameter of 10 cm and triangle ABC is equilateral. Points M and N lie on AC and BC respectively.

(i) Explain why ΔOAM and ΔOBN are equilateral. [2]

(ii) Find the total area of the shaded regions. [5]



[Ans: (ii) 4.53 cm^2]

29 **2001/S2MA/EOY/SectB/Q15**

For this question, take $\pi = 3.142$ and give your answers correct to 1 decimal place.

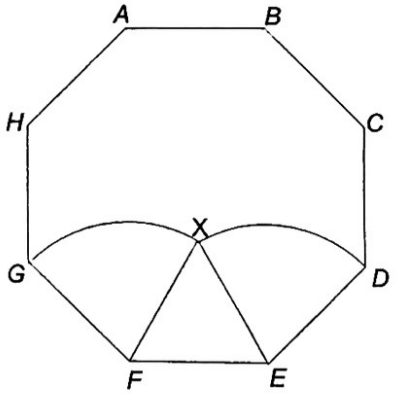
ABCDEFGH is a regular octagon of side 8 cm. Arc *GX* is drawn with centre *F* and radius *GF*, and arc *XD* is drawn with centre *E* and radius *ED*.

Find

(i) $\angle GFX$, [4]

(ii) the area of sector *GFX*, [2]

(iii) the area of the region **bounded** by the arcs *GX* and *XD*, and the line segments *GF*, *FE* and *ED*. [4]



[Ans: (i) $\angle GFX = 75°$ (ii) 41.9 cm^2 (iii) 111.5 cm^2]